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General Surgery

The "Calibrated" Papillosphincterotomy as a Factor of Success in the Surgical Treatment of Anatomic and Functional Disturbances of Oddi's Sphincter: Standardized Technic

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THE operative surgery which aims to enlarge the lumen of Vater's papilla, or to lessen the strength of Oddi's sphincter muscle, has been appreciated in different ways by several authors with regard to its results, indications and technic.

The aim of this work is to show that results may be very good, as they have been in many cases; that the indications may be irrefutable, even though at present they can not be easily classified; and, finally, that the standardized technic, obviously the same in all cases, is the basis for comparison of results, since the small size of the structures involved demands the maximum of operative planning detail.

In March 1957 I published a thesis, *Clinical Results of Papillosphincterotomy* (total section of Vater's papilla and partial section of Oddi's sphincter), in which I studied the subject of this paper. I do not propose, however, to repeat concepts

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already formulated, but to widen and round off the knowledge I have been able to gather in the study of 26 cases, with a minimum follow-up of one year.

All 26 cases are from the private practice of Prof. Dr. Resende Alves, professor of Surgical Operative Technique at the Faculty of Medicine, University of Minas Gerais, and the patients were operated upon by him, always with the same technic, which was developed by himself.

I have contributed the analysis of the available literature and the follow-up of the patients to the time of writing, thus being able to conclude that the exact explanation of the excellent results obtained has now been found.

Because the technics differ from one author to another and even, frequently, vary in successive operations performed by the same author, and also because technic is not often adequately described, analysis of the literature is not easy.

Even the names given by various authors to the operation for enlarging the end of the common duct are various, which renders research difficult.

The operation is most commonly called papillotomy or sphincterotomy, without explanation as to the difference between the one and the other; besides, even by close scrutiny of the descriptions it is not possible to see what makes them choose one or the other name, as for instance Mallet-Guy and Jeanjean (1944) who referred to the débridement of Oddi's sphincter to the extent of 2 mm., and report the next year (Mallet-Guy, Jeanjean and Feroldi, 1945) having performed *papillotomy* with a 15 mm. section.

Thus it is highly agreeable to find in Bove (1956) a greater precision of language. He explained that papillotomy is transformed into sphincterotomy when the section reaches the common duct part of the sphincter. For Bove, then, total or partial section of the common duct part of the sphincter is what essentially characterizes sphincterotomy. It is a point of view perfectly justifiable and defensible, and I should not hesitate to adopt it were it not for the difficulty of affirming, in each case, that section of the common duct part of Oddi's sphincter has been done.

The name papillosphincterotomy seems, at the moment, to fit better as an exact term, since, from what I have been able to conclude from the literature, and especially from the study of Rettori (1956), the part of Oddi's sphincter common to both Wirsung's canals and the choledochus is always sectioned when one incises the papilla.

The expression papillosphincterotomy is, by the way, employed in one article (by Soupault and others, 1957) to which I have found references but have not been able to study personally. This work was published two months after presentation of our thesis to the Faculty.

Between Sept. 16, 1952, and Feb. 14, 1956, Prof. Resende Alves operated on 29 patients, in whose cases he had the opportunity to perform papillosphincterotomy without draining the bile ducts in any of the cases.

Of the 29 patients, 2 died. Prof. Resende Alves and I have not been able to correlate their deaths with the additional risk of papillosphincterotomy (there was no accidental opening of the duodenum, no duodenal fistula, and no ascending infection of the biliary tract). Of the 27 other cases, 1 had to be excluded because we could not obtain data on the patient's health. The number of deaths (2) does not seem to us excessively high. As few surgeons perform these operations, patients are, as a rule, referred for operation in very bad condition. There are many causes of organic waste, among which must be included years of suffering, severe nutritional restrictions of long duration and the frequent taking of analgesic medicine for continuing pains. All these are conditions that augment the surgical

risk, and even good preoperative treatment may not overcome effectively the long, severe misery and lowered resistance.

There are thus 26 cases left, in all of which operation was performed more than a year ago, in which papillosphincterotomy was performed for several reasons (suspected choledochus calculi, confirmed or not; hypertony of Oddi's sphincter, and inflammatory lesions).

Of the 26 patients, 24 are in excellent condition, without nutritional restrictions, antiallergic treatment or any complaints; one is also in excellent condition but requires alimentary restrictions and antiallergic treatment; and 1 is well but has diet restrictions (fried food and milk) and complains occasionally of headache and nausea.

To summarize: Of the 26 cases, in which we could follow up the patient for one year or more, in 24 the results were excellent. In 1 they were excellent (though dependent upon diet and antiallergic treatment), and in 1 they were good.

At no time did we encounter any symptoms of cholangitis, pancreatitis, rupture of the duodenum or peritonitis in any of the 26 cases. Thus, except for the 2 deaths due to bad organic conditions brought about by long-standing disease, the postoperative course has been favorable, and results, both immediate and mediate, were excellent or good.

The results obtained from papillosphincterotomy performed by Prof. Resende Alves show that the authors who are against any papillotomy technic, sphincterotomy or any equivalent operation, as essentially dangerous to the patient, are wrong. On the other hand, owing to the diversity of the results described in the literature, one can understand why, *a priori*, a great number of authors including Gosset (1940), Ferracani (1945), Suarez (1946), Montaldo (1952), Bustos (1953), Walters (1954), Cinelli (1945), Magaldi (1955) and Barbosa (1956), are hesitant or fearful of sending patients to be operated on in such cases.

In a study of 26 consecutive cases in which the orifice of the lower end of the choledochus was surgically enlarged by Prof. Resende Alves' technic for papillosphincterotomy (total resection of Vater's papilla and partial section of Oddi's sphincter), the author describes and illustrates the operative procedure and presents the results as observed after one to five years. Of the 26 patients, 24 obtained excellent results without medical treatment or restriction of diet; in 1 the results were also excellent, though antiallergic treatment and diet restrictions were required, and in 1 the results were good despite occasional headache and nausea and the need of a restrictive diet.

Suarez, especially, has expressed himself violently against papillotomy, describing 1 case in which calculus was extracted from the ampulla and a "papilloplasty" by the del Valle technic was done. The patient felt better for some months, then showed unmistakable signs of ascending infection and died five years later of angiocholitis and jaundice. Exploration of the duodenum by probing just prior to her death showed bile with purulent clots, and contrast duodenographic study showed the biliary tract filled with contrast medium even to the thinner "branches." At necropsy it was observed that the liver was like a purulent sponge. "One cannot," says Suarez, "have a more conclusive proof of Oddi's sphincter suppression."

The reason for the filling of biliary ducts with contrast medium deposited in the duodenum escapes one's understanding. One must presume a mechanism of intrahe-

patic aspiration or intraduodenal hypertension, but it is not clear how the suppression, even the total suppression, of Oddi's sphincter could cause, by itself alone, a countercurrent circulation in the biliary ducts so marked as to cause material deposited in the duodenum to fill up even the smallest biliary "branches."

This belief is not based solely on reasoning, for in Prof. Resende Alves' series there is 1 case of confirmed cholangitis which was cured after papillosphincterotomy (operation performed on Sept. 27, 1954).

CASE 1.—O. M. J., a white, married male, Brazilian, aged 52, a Government employee, began feeling abdominal pain while apparently in good health. Later, vomiting, jaundice, fever and ascites were noticed. The patient had never had colic or jaundice. Fifteen days after the beginning of the symptoms he was operated on. His general condition was bad. Cholangiographic study showed the terminal part of the choledochus to be inflated. No calculus was detected either in the gallbladder or in the choledochus. The gallbladder was spared, but papillosphincterotomy was performed without subsequent drainage. The patient improved and was discharged in sixty days. Histopathologic study of a liver fragment showed "cholangiolitis, subacute and chronic, with cholostasis, and bile thrombus in the biliary capillaries." The patient is in excellent condition at the time of writing, with no complaints, alimentary restrictions or medication.

It is difficult to understand Suarez's statement that papillotomy caused cholangitis, when in the case of Prof. Presende Alves just cited papillosphincterotomy seems to have been the decisive factor in cure. The patient is well and has been well for more than three years.

If Suarez had offered more details of his case (size of incision in the papilla, etc.), it might be easier to understand the cause of the cholangitis he described.

It is difficult to compare technics which have been only described, and to evaluate the results is still more so. It is always easy to say that papillosphincterotomy is indicated by characteristic elements of this dyskinesia in actual cases.

Thus the problem of indications for papillosphincterotomy is a serious one.

The usual methods of studying biliary tree functions (cholangiographic, manometric) from which one might obtain the indication, present several sources of error; one cannot affirm that high pressure in the biliary tree, shown by one or more manometric readings during an operation, indicates the need for papillosphincterotomy. The thorough study we have been able to make retrospectively in the cases of Resende Alves shows that in 15 of the 26 cases there were calculi in the terminal portion of the choledochus. The satisfactory postoperative results might therefore be attributed to extraction of the calculi. In none of the other 11 cases, however, were calculi present in the choledochus, though calculi of the gallbladder were present in 5. Six of the 26 patients had no calculi whatsoever.

It seems that a minute analysis of the cases would tend not to clarify but to blur the conclusion. Two cases, however, are outstandingly helpful and deserve special mention:

CASE 2.—M. A. M., a white Brazilian housewife, aged 46, stated that she had been operated upon (cholecystectomy) in 1947; nine months after the operation pain reappeared, every time more and more closely spaced and more acute. Papillosphincterotomy was performed by Prof. Resende Alves. Cholangiographic study showed a dilated choledochus with a tapering terminal portion and a filling of slight extension in Wirsung's duct. No calculus was present in the choledochus. Since then, for more than four years, the patient has been well, with no complaints and no special diet.

Another interesting case is as follows: M. S. B. F., an unmarried white Brazilian housewife, 28 years old, had undergone appendectomy for abdominal pains at the age of 18. At 22, again because of abdominal pains, cholecystectomy was performed. The same pains sent her to a series of examinations and

treatment, with no result. Classified as "probably neurotic," she was sent to Prof. Resende Alves. Roentgen studies showed a normal stomach, duodenum, esophagus and cardia. Excretory urographic study disproved the existence of ptosis or renal calculi. Allergic tests gave negative results, as did brucellosis tests (serum agglutination and cutaneous test). After a diagnosis of Oddi's sphincterotomy, papillosphincterotomy was performed on Nov. 25, 1952. No calculus was found in the choledochus. Since then the patient has been well, with no complaints and no special diet.

The 2 cases just cited are sufficiently free of doubts as regard to diagnosis. In neither were calculi present; besides, the long-standing pain (five years in one case and ten in the other) disappeared after papillosphincterotomy.

Surgical Technic.—The earliest report on papillotomy for the extraction of calculi we could find was published by Kocher in 1895.

In 1898 McBurney described the opening of the duodenum in 6 patients, and from the inferior portion of the choledochus he extracted calculi after sectioning Vater's papilla.

In 1919, Archibald suggested, as a preventive measure for high biliary pressure, sectioning of the choledochus sphincter. Later (no date mentioned) he performed transduodenal sphincterotomy on 8 patients for pancreatitis.

After these ancient experiments there is a long period in which very few references were made to this operation.

In 1939 Del Valle studied "scleroretracti odditis" and referred to 34 cases, in 22 of which he performed papillotomy, sphincterotomy or an equivalent operation.

Since then a greater number of authors have taken an interest in the problem. The majority of the articles, however, have reported only a few cases. Each author's technic seemed to change from case to case, and descriptions are usually insufficient. All this makes it extremely difficult, from an analysis of the existing literature, to reach a conclusive decision as to the best technic.

Two methods were followed in an attempt at standardization; first that of Colp and Doubilet (1938), with an attempt always to make the section of the same extent, and second, the technic of Christman and Deschamps (1951), Lesala and Mazlo (1953) and Resende Alves which aims at determining a standard caliber for the papilla.

The apparatus designed by Colp and Doubilet is a metallic stem 4 mm. in diameter, having at its extremity a sharp blade which, by a lever mechanism, may be elevated and closed. The metallic stem is introduced into the choledochus and penetrates into the duodenum. Once past the papilla, both the point and the blade of the apparatus being inside the duodenum, the apparatus is pulled slightly backward and the blade is raised and put in contact with the papilla. The closing of the blade then limits the section of the papilla and sphincter to a distance of 11 mm. The duodenum is not opened; the section is not controlled visually, and the choledochus is not sutured to the duodenum.

Section of the papilla and sphincter without suture of the choledochus to the duodenum seemed to us, owing to the variability of choledochus implantation, capable of opening the duodenum completely, permitting escape of the duodenal contents and bile.

In order to establish clearly up to what distance from the orifice of the papilla a section can be made without subsequent need of suture, we made a study of cadavers of 30 adults of both sexes. The first, second and third duodenal portions were taken away *en masse*, together with part of the pancreas.

The duodenum having been opened, the papilla was located and the choledochus catheterized. Over the catheter introduced into the papilla, an incision was made

Figs. 1 to 5, inclusive.—Fig. 1, cholecystectomy. Introduction of tube into cystic duct for manometric and cholangiographic study. Fig. 2, tube for manometric and cholangiographic examination adapted and tied to stump of cystic duct. Metallic catheter 2 mm. in diameter exteriorized through Vater's papilla by transverse incision of duodenum. Thread fastened in groove of catheter. Fig. 3, thread introduced into choledochus by means of metallic catheter is attached by transfixion to end of Nelaton probe. Fig. 4, traction on thread, causing introduction of Nelaton's probe into choledochus. Fig. 5, lancet section of papilla and part of Oddi's sphincter over protrusion caused by point of Nelaton's probe.

with a scalpel in the posterior wall of the duodenum and the anterior wall of the choledochus. Each was examined and the distance to which, in our opinion, the section could be carried *in vivo*, without need of suture, was measured in millimeters.

The possible size is to some extent a matter of opinion, as it is difficult to judge exactly the maximum possible incision in each particular case. A section 11 mm. long would be too long in a number of cases and would result in a duodenal fistula, judging from our observations in the cadaver.

As a matter of fact, the instrument is no longer in use as related by Lester and Colp (1952). But even before that Del Valle (1951) stated that Colp had written him describing a series of serious accidents (wrong way) due to the use of the instrument. Del Valle referred to the "wrong way," not alluding, as we do, to the possibility of too large a section. It must be borne in mind, however, that even in a necropsy it would be difficult to distinguish clearly a "wrong way" from a clean section if, at some time, the duodenal contents, of high digestive power, had been spilled.

Calibration technics show a clear superiority over incisions of varying sizes for each case or of uniform size for all cases. The idea of sectioning the papilla and sphincter so as to allow the passing of an instrument of a certain caliber seems to us the most logical. The size of the section will obviously vary from case to case, but in general the caliber obtained will always be the same.

Papillosphincterotomy by this method is similar to section of the urethral meatus in the operation of meatotomy, the size of the opening being the important factor and the exact size of the section being almost irrelevant.

Even if this reasoning seems to invite *a priori* criticism, the excellent results obtained with Resende Alves' technic point out that it is right.

Christman and Deschamps (1951) favored gauging by means of a special instrument, and their results are among the best in the literature. Of their 40 papillotomy patients, 33 could be followed, and the results were classified as follows: 23, excellent; 6 good, and 3, poor. There was 1 death from duodenal fistula a month and a half after the operation.

Christman and Deschamps stated that, observing closely the state of the terminal portion of the choledochus, they saw that the papilla often showed fibrous retraction, while at other times the muscle was enlarged, as if by hypertrophy. They insisted on internal papillotomy with "our papillotome," which, they claimed, determines the normal caliber of the papilla.

Lasala and Mazlo (1953) described an instrument, a "papillotractor," designed to facilitate transduodenal papillotomy. It is a stem to the end of which one may adapt one of three cones (9, 11 or 13 mm. in diameter). This stem is introduced into the choledochus and passes through the papilla after supraduodenal choledochotomy. After the duodenum has been opened, traction is applied to the papilla by a cone previously chosen and adapted to the stem; papillotomy is then performed.

Personally, we know surgeons who employ this method but have been unable to ascertain their results.

Among the technics for calibration, Resende Alves' is the easiest to carry out. There is no need of special instruments, and it may be performed nearly "impromptu," even in the most unfavorable conditions.

It may be described succinctly as follows:

The abdomen is opened by a right Lenander incision (internal, pararectal).

The gallbladder and the cystic duct are dissected up to the hepatocholedochus.

After traction by transfixion with catgut, which enormously facilitates the maneuvers, the cystic duct is incised. The metallic probe is introduced into the cystic duct or, less frequently into the choledochus, for manometric and cholangio-

graphic study. Cholecystectomy is then performed.

Supraduodenal choledochostomy, exploration of the choledochus and extraction of calculi, and transduodenal papillosphincterotomy are then carried out.

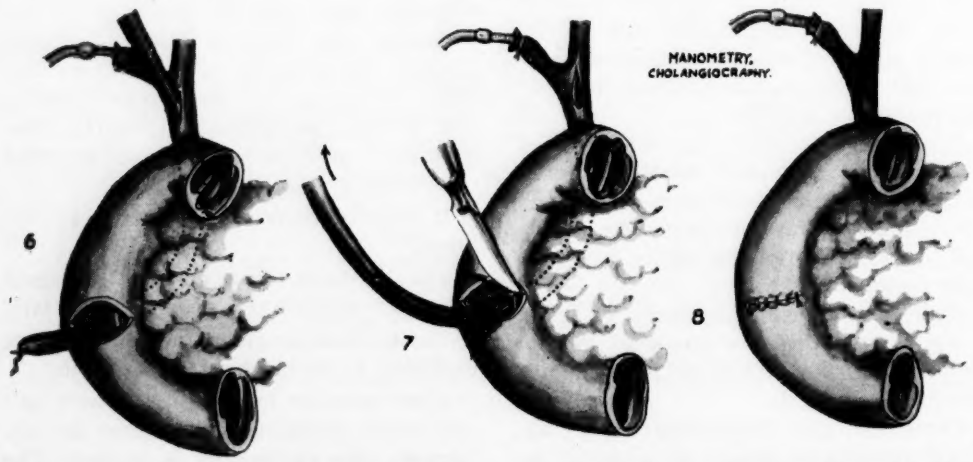
The choledochus is sutured without drainage; the duodenum and the abdominal wall are sutured.

Papillosphincterotomy itself implies a small series of maneuvers, shown in the accompanying illustrations. After the gallbladder has been freed and the cystic duct dissected, the latter is opened and a metallic probe introduced for manometric and cholangiographic study (Fig. 1). The choledochus is then opened longitudinally above the duodenum. Into the duodenum is introduced a flexible metallic probe 2 mm. in diameter, with a small shallow groove near its point. The duodenum is opened transversely, preferably after the probe has passed the duodenal papilla, so that the protruding point of the probe shows the best point of incision. Duodenotomy will reveal the catheter point, and a thread is then fastened to it (Fig. 2).

The probe is then taken out backward, the thread being left in the choledochus. This thread is cut and transfixed, with the help of a needle, to the extremity of a Nelaton catheter No. 18 or 20 (Fig. 3). This is then pulled, the choledochus being entered (Fig. 4) until the point thrusts out the duodenal papilla. This is sectioned (Fig. 5), together with the mucosa of the duodeum and choledochus; the Nelaton catheter is then pulled almost completely out of the duodenum (Fig. 6) until its greater diameter is held by the partially sectioned papilla.

Another small section with a lancet (Fig. 7) will allow complete freeing of the catheter. The section is then observed in order to see whether it is necessary to suture the mucosa of the duodenum and choledochus.

It must be recalled that the diameters of the Nelaton catheters No. 18 and 20 are 6 and 6.7 mm. respectively; we have



Figs. 6, 7 and 8.—Fig. 6, beginning of withdrawal of Nelaton's probe. Fig. 7, additional section (not always necessary) of papilla and Oddi's sphincter to allow withdrawal of larger end of Nelaton's probe. Fig. 8, suture of duodenum and choledochus. Manometric and cholangiographic studies by tube in cystic stump, if indicated.

checked these measurements personally (pachimeter and vernier).

The end of the Nelaton catheter, opposed to the point, has a larger diameter; by pachimeter their diameters were 8.5 mm. (No. 18) and 9 mm. (No. 20). Arithmetical calculation shows that larger diameter extremity of No. 18 catheter corresponds to a 26.7 mm. circumference and to a half circumference of 13.35 mm. A No. 20 catheter has a circumference of 28.23 mm. and a half circumference of 14.12 mm. Such precision, however, is meaningless in practice, and one may consider the half circumferences of the larger ends of catheters No. 18 and No. 20 to be 13 and 14 mm. respectively. One might conclude that the extent of the sections in papillosphincterotomy would be 13 to 14 mm. It is, in fact, much smaller, and in our opinion this is due to two factors: 1. The larger end of the catheter (which is made of rubber) has thin walls and so can easily be squeezed and made smaller by the resistance of the tissues, and 2. the elasticity of the tissues themselves causes them to yield to the passage of the catheter and afterward retract.

SUMMARY

This paper reports 26 consecutive cases in which the inferior extremity opening of the choledochus was surgically enlarged by the technic of papillosphincterotomy of Prof. Resende Alves (total section of Vater's papilla and partial section of Oddi's sphincter).

The results of the 26 operations, after a follow-up period varying from one to five years, were thus classified:

Excellent results without medical treatment or diet restrictions	24
Excellent results but antiallergic treatment and diet restrictions required	1
Good results (with occasional headache and nausea) but restrictive diet required	1

Papillosphincterotomy was indicated by the suspected presence of calculi in the choledochus (later confirmed or not), hypertony of Oddi's sphincter, odditis of cholangitis.

The technic followed by Prof. Resende Alves may be thus summarized:

a. Dissection and opening of the cystic duct in order to introduce a tube for manometry and cholangiography (Fig. 1).

b. Incision of the choledochus above the duodenum (Fig. 2).

c. Introduction into the choledochus of a metal catheter, the point of which passes through Vater's papilla (Fig. 2).

d. Opening of the duodenum through its anterior wall (Fig. 2).

e. Introduction into the choledochus of a thread (tied to the metal catheter) through the papilla (Fig. 2).

f. Tying of the thread to a No. 18 or 20 Nelaton tube, which is then pulled through the choledochus down to the papilla (Figs. 3 and 4).

g. Section of the papilla, together with the common bundle and choledochus bundle of Oddi's sphincter muscles, on the protrusion caused by the point of the Nelation tube (Fig. 5).

h. Pulling of the tube through the papilla (Fig. 6), with eventual additional section (Fig. 7), so as to allow the tight-fitting passage of the tube, including the end with the larger diameter (8.5 and 9 mm. diameter for tubes Nos. 18 and 20).

i. Careful inspection to check the need for suture of the choledochus to the duodenum.

Analysis of the literature on the subject for comparison of results obtained by other authors with papillotomy, sphincterotomy or similar operations was difficult because technics varied either with the same authors or from one author to another, as well as because of the deficiency of their description.

Logic and the results of this study, however, indicate that section of Vater's pa-

pilla and of Oddi's sphincter should be done only by the calibration technic, that is, bearing in mind the diameter of the instruments to be introduced into the terminal part of the choledochus. The size of incision ought not to be predetermined.

ZUSAMMENFASSUNG

In diesem Artikel berichtet der Verfasser über 26 Patienten, bei denen die Öffnung der unteren Extremität des Choledochus nach der Papillosphincterotomie-Technik von Prof. Resende Alves (ganze Durchschneidung der Vaterschen Papilla und eines Teiles des Oddischen Sphincters) vergrössert wurde.

Diese 26 Patientes wurden 1 bis 5 Jahre beobachtet und die Ergebnisse waren folgende:

1) Ausgezeichnete Erfolge ohne medizinische Behandlung und ohne Ernährungsbeschränkung in 24 Fällen.

2) Ausgezeichneter Erfolg mit Ernährungsbeschränkungsbehandlung in einem Fall.

3) Guter Erfolg (mit gelegentlichen Kopfschmerzen und Brechreiz oder Übelkeit) mit Ernährungsbeschränkungen in einem Fall.

Der Grund zur Papillosphincterotomie war der bestätigte oder nicht bestätigte Verdacht auf Steine im Choledochus, Sklerosis oder Entzündung des Oddischen Schliessmuskels und Cholangitis.

Die Technik der Papillosphincterotomie von Prof. Resende Alves kann so zusammengefasst werden:

a) Freilegung und Öffnung des Cysticus und Einführung der Kanüle in die Öffnung zur Manometrie und Cholangiographie (Bild 1).

b) Öffnung des Choledochus über dem Zwölffingerdarm (Bild 2).

c) Öffnung des Zwölffingerdarmes in seiner vorliegenden Fläche (Bild 2).

d) Ein Katheter aus Metall wird durch den Choledochus eingeführt; seine Spitze geht durch Vater's Papilla (Bild 2).

e) An die Spitze, die einen Kopf hat, wird ein Faden angebunden (Bild 2).

f) Dieser Faden, wird durch den Choledochus durchgezogen (Bild 3 und 4).

g) Dann zieht dieser Faden eine Nelatonsonde No. 18 oder 20 durch den Choledochus (Bild 5).

h) Über dem Vorsprung der Sonde in Vaters Papilla wird eine Inzision gemacht, wenn die Sonde durchgezogen wird. Wenn es nötig ist, kann man diese Öffnung vergrössern, damit die ganze Sonde mit ihren Verlängerungen durch Vaters Papilla gehen kann (Bild 6 und 7).

i) Sorgfällige Beobachtung ist notwendig, um zu erkennen, wann eine Vernähung des Choledochus mit der Schleimhaut des Zwölffingerdarmes nötig ist.

Die Analyse der Literatur zur Vergleichung der Erfolge der Operationen von Papillotomie, Sphincterotomie oder gleichwertiger Eingriffe ist nicht leicht, denn es gibt viele Techniken von verschiedenen Verfassern, und die Beurteilung hängt von der Technik jedes Verfassers und der Unzulänglichkeit der Beschreibung der Operationen ab.

Die Auswertung der Erfolge der Operationen der Papillotomie plus Sphincterotomie, zeigt dass diese Operationen nur mit Kalibrierungstechnik gemacht werden dürfen.

Das Kaliber der Sonden, die durch die Extremität des Choledochus gehen müssen, muss bekannt sein.

Die Teile des Schnittes müssen nicht vorher bestimmt sein.

SUMARIO

Apresenta 26 casos em foram praticados os alargamentos da abertura inferior do coledoco com papiloesfincterectomia do Prof. Resende Alves (secção total da papila de Vater e secção parcial do Oddi).

Numa sequencia de um a cinco anos os resultados foram classificados em:

Excelentes com tratamento medico ou dieta 24

Excelentes porem com necessidade de tratamento antiallergico e dieta.. 1

Bons resultados (com cefalea ocasional e nausea) porem com dieta restrita 1

As indicações da papiloesfincterectomia foram calculose (confirmada ou não), hipertonia do Oddi, oddite ou colangite.

Resume a tecnica do Prof. Resende Alves da seguinte forma:

a. Dissecção e abertura do cistico para permitir a monometria e a colangiografia (Fig. 1);

b. Incisão do coledoco acima do duodeno (Fig. 2);

c. Introdução de cateter metalico no coledoco atraves a papila de Vater;

d. abertura do duodeno na paree anterior (Fig. 2).

e. Introdução no coledoco de um fio amarrado ao cateter metalico atraves a papila de Vater (Fig. 2);

f. fixação do fio a um tubo de Nelaton n. 18 ou 20 que é então trazido para a papila atraves o duodeno (Figs. 3 e 4);

g. secção da papila juntamente com o feixe coledoco do esfincter de Oddi no ponto de saliência do tubo de Nelaton (Fig. 5);

h. passagem do tubo pela papila (Fig. 6) com eventual secção adicional (Fig. 7) para permitir a passagem do tubo com o diametro maior (8.5 e 9 mm.);

i. inspecção cuidadosa para verificar se é necessario suturar o coledoco ao duodeno.

Dizem os AA. que a revisão bibliografica feita para comparação com a papilotomia, esfincterectomia e operações similares foi dificial.

Asseguram, pelo resultado desses estudos, que a secção da papila de Vater so deve ser feita pelas tecnicas que empregam calibragem, tendo em vista o diametro dos tubos utilisados.

RÉSUMÉ

L'auteur décrit 26 cas consécutifs où l'ouverture de l'extrémité inférieure du cholédoque a été chirurgicalement agrandie selon la technique de papillosphinctérotomie du Prof. Resende Alves (section complète de la papille de Vater et section partielle du sphincter d'Oddi).

Les résultats de ces 26 interventions ont été classifiés de la façon suivante après une période d'observation post-opératoire de cinq ans:

Rèsultats excellents sans traitement médical ni régime 24

Résultats excellents mais avec traitement allergique et régime..... 1

Bons résultats (maux de tête et nausées occasionnels) avec régime 1

L'indication de la papillosphinctérotomie a été basée sur la présence possible d'un calcul du cholédoque (confirmé ou non par la suite), sur une hypertonie du sphincter d'Oddi, sur une oddite ou une angiocholite.

La technique utilisée par le Prof. Resende Alves peut être résumée comme suit:

a) Dissection et incision du canal cystique en vue de l'introduction d'un tube de manométrie et de cholangiographie (fig. 1).

b) Incision du cholédoque au-dessus du duodénum (fig. 2).

c) Introduction d'un catheter métallique dans le cholédoque, dont la pointe passe à travers la papille de Vater (fig. 2).

d) Incision de la paroi antérieure du duodénum (fig. 2).

e) Introduction dans le cholédoque à travers la papille (fig. 2) d'un fil fixé au catheter métallique (fig. 2).

f) Fixation du fil à un tube de Nelaton No. 18 ou 20, que l'on fait passer ensuite à travers le cholédoque jusqu'à la papille (fig. 3 et 4).

g) Incision de la papille ensemble avec le faisceau commun du cholédoque au niveau du sphincter d'Oddi par-dessus la

protrusion causée par la pointe du tube de Nelaton fig. 5).

h) Faire passer le tube à travers la papille (fig. 6), avec agrandissement éventuel de l'ouverture (fig. 7), afin de permettre le passage bien ajusté du tube, y compris l'extrémité de diamètre plus large (8,5 et 9 mm de diamètre pour les tubes No. 18 et 20).

i) Inspection minutieuse afin de vérifier la nécessité d'une suture du cholédoque au duodénum.

Une analyse de la littérature en vue de comparer les résultats obtenus par d'autres auteurs au moyen de la papillotomie, de la sphinctérotomie ou de techniques similaires, a été plutôt négative du fait que les techniques varient chez un même auteur ou d'un auteur à l'autre, et que les descriptions sont souvent lacunaires.

Cependant la logique, ainsi que les résultats de la présente étude, montrent que la section de la papille de Vater et du sphincter d'Oddi ne devrait être pratiquée que par des techniques dites de calibrage, c'est-a-dire en se basant sur le diamètre des instruments à introduire dans la partie terminale du cholédoque. La dimension de l'incision ne devrait jamais être prédéterminée.

RIASSUNTO

Vengono riferiti 26 casi consecutivi in cui si praticò l'allargamento chirurgico dello sbocco del coledoco secondo la tecnica di papillosfinterectomia di Resende Alves (sezione totale della papilla di Vater e sezione parziale dello sfintere di Oddi).

I risultati di questi 26 interventi, valutati alla distanza di uno-cinque anni, furono i seguenti:

Risultati eccellenti senza bisogno di cura medica 24
Risultati eccellenti ma con necessità di trattamento antiallergico e di restrizioni dietetiche 1
Risultati buoni (con cefalea e nausea saltuariamente) ma con dieta restrittiva 1

La papillosfinterectomia fu indicata nei casi di sospetta presenza di calcoli nel coledoco (confermata o meno), di ipertrofia dello sfintere di Oddi, di oddite o colangite.

La tecnica seguita è la seguente:

a. Dissezione e apertura del cistico e introduzione del tubo per manometria e colangiografia.

b. Incisione del coledoco sopraduodenale.

c. Introduzione nel coledoco di un catetere metallico la cui estremità oltrepassa la papilla di Vater.

d. Apertura del duodeno attraverso la sua parete anteriore.

e. Introduzione nel coledoco, attraverso la papilla, di un filo legato al catetere metallico.

f. Legatura del filo ad una sonda di Nelaton n. 18/20, che viene quindi tirata dal coledoco nella papilla.

g. Sezione della papilla assieme al fascio comune e al fascio coledocico del muscolo sfinterico al di sopra della sporgenza determinata dall'estremità della Nelaton.

h. La sonda viene tirata attraverso la papilla, completando eventualmente la sezione, così da consentire un passaggio e una aderenza perfetta.

i. Revisione accurata onde stabilire la necessità di sutura del coledoco e del duodeno.

E' stato difficile analizzare la letteratura sull'argomento, onde paragonare i risultati ottenuti con altri metodi (papillotomia, sfinterotomia o simili) poichè le tecniche variano da caso a caso e molto spesso non sono neppure sufficientemente descritte.

La logica e i risultati ottenuti, tuttavia, consentono di affermare che la sezione della papilla di Vater e dello sfintere di Oddi debbono essere eseguite soltanto con una tecnica che tenga conto dei calibri, e

cioè del diametro degli strumenti da introdurre nella porzione terminale del coledoco.

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A good surgeon operates with his hand, not with his heart.

—*Dumas*

Science keeps down the weed of superstition not by logic, but by rendering the mental soil unfit for its cultivation.

—*Tyndall*

Abdominoperineal Resection with Ligation of the Hypogastric Arteries

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The author describes his favorable experience in 80 cases of bilateral ligature of the hypogastric arteries in radical rectal operations for carcinoma. His results confirm a decrease of hemorrhage attributable to perineal resection. The technic he employs is described in detail, with emphasis on the necessity of preventing injury to the internal iliac vein.

THE loss of blood during and after an abdominoperineal surgical procedure for carcinoma of the anus and rectum deserves the surgeon's special consideration.

The larger the perineal removal because of the size of the tumor or compromise of adjacent organs or tissues—bladder, vaginal wall or corpus uteri—the greater is the amputable area of perivisceral tissue, thus increasing the bleeding surface.

The requisites of this operation are well known. It involves extensive resection of the sacrorectal ligaments, the levator ani muscles, the Waldeyer fascia, the presacral fat tissue and the surrounding perivascular tissue of the pelvic arteries to perform an adequate lymphadenectomy. This area is well irrigated already, and with the increased vascularization due to the formation of new vessels, it becomes obvious why the risk of hemorrhage should be considered and preventive measures taken.

Two sources of major importance nourish the operative area: (1) the *inferior mesenteric artery*, which, through the sigmoid and superior hemorrhoidal branch, irrigates the distal part of the sigmoid and the superior third of the rectum, finally anastomosing with the terminal branches of the middle hemorrhoidal arteries, and (2) the *hypogastric or internal iliac artery*, "the great artery," through its visceral and parietal branches, irrigates a large area of the pelvic perineal tissue that must be surgically removed. The large and smaller branches deriving from the hypogastric arteries and the middle and inferior hemorrhoidal vessels are an extremely important part of the blood stream and sometimes cause significant bleeding during the operation or immediately after. This phenomenon is attributable to the fact that some branches are not properly occluded and apparantly do not bleed, owing to the temporary fall of blood pressure. When the electrocautery is used, bleeding is present when small eschars are eliminated.

This morbid condition is most pronounced in patients of advanced age, in whom the frequency of arteriolosclerosis conspires against perfect hemostasis. Metabolic disorders, common in neoplastic disease, must also be admitted as causing changes in the coagulation factors.

Since 1948, therefore, to overcome this risk, I have ligatured both hypogastric ar-

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Submitted for publication May 5, 1958.

teries during the abdominal stage of the procedure, as follows: Having estimated the extent of surgical removal of the tumor, I begin the peritoneal dissection at the base of the pelvic portion of the mesocolon, with immediate investigation of the left hypogastric artery. The projection of the promontory is a good point of reference in recognizing the level of bifurcation of the primitive iliac artery. Using an aneurysm needle with medium-sized linen thread, I surround and ligate the vessel approximately 2 cm. from the bifurcation, with a double-knot support. Care must be taken not to injure the internal iliac vein, which is observable on the inner side and behind the artery. The peritoneum of the pelvic mesocolon on the opposite side is dissected and the right hypogastric artery ligated. A good procedure is a blunt dissection, performed by inserting the index finger through the opening made on the left side of the pelvic mesocolon and moving opposite to and behind the inferior mesenteric artery. This maneuver is carried on until the right sheet of the pelvic mesocolon has been dissected. On both sides, but particularly on the left, attention must be paid to protecting the ureter.

After the occlusion of both hypogastric arteries, the inferior mesenteric artery is ligated and cut. I perform this operation with two surgical teams, and the perineal stage begins once the aforementioned three ligatures are in place.

There was no evidence of damage to other organs or tissues attributable to this double hypogastric ligature. Neither the anatomophysiologic features of the bladder nor the nutrition or healing of the perineal tissues suffered.

Reviewing an unselected group of 80 cases in which this technic was used, I encountered only 2 instances of perineal hemorrhage of some importance in patients with invading carcinoma provoking infiltration of the mesosigma and perirectum (ultra-radical operations). The mortality rate for this group was 6 per cent. As compared with other series in which the hypogastric ligature was not performed, the bleeding during or immediately after the operation was unquestionably less.

In previous publications I have commented on the satisfactory results of this procedure.[1]

On the occasion of the Sixth International Cancer Congress held in San Pablo in 1954, Lawrence Abel[2] of the Royal Cancer Hospital (London) personally informed me that he has systematically performed ligature of the hypogastric artery for many years, with good results. In the literature on this subject are references attributing to Kischner of Germany the use of this method in 1898. Testut and Jacobs[3] (1927), in their well-known work on anatomy, mention the fact that to offset the hemorrhage in rectal surgical procedures "it is preventively advisable to perform bilateral ligature of the hypogastric arteries." Bacon,[4] in a recent article states: "For the last five years in all Miles operations we have ligated the internal iliac artery (hypogastric) of each side, beneath its superior gluteal branch, without complications." Swinton,[5] of the Lahey Clinic, recently pointed out that he has initiated its employment and is ready to enlarge his experience.

In conclusion, my opinion is that ligature of both hypogastric arteries is a valuable recourse in abdominoperineal surgery and is not associated with sequelae that limit its use.

RÉSUMÉ

L'auteur décrit les bons résultats obtenus dans 80 cas de ligature bilatérale des artères hypogastriques dans les opérations radicales du rectum, avant pour résultat

une diminution de la fréquence de l'hémorragie, due à la résection périnéale.

SUMARIO

O A. descreve sua experiencia em 80 casos de ligadura bilateral das arterias hipo gastrica na operação do reto com redução de hemorragia na resecção perine al.

RESUMEN

El autor señala que la ligadura bilateral de la arteria hipogástrica reduce los peligrow de hemorragia en el resección de recto por vía perineal y dice que ha tenido buenos resultados en los 80 casos que ha tratado.

ZUSAMMENFASSUNG

Der Verfasser berichtet über seine guten Erfahrungen mit der doppelseitigen Unterbindung der A. hypogastrica, die er bei 80 Fällen von radikaler Mastdarmresektion ausgeführt hat. Das Verfahren trägt zur Herabsetzung der Sterblichkeit durch Blutungen, die der perinealen Resektion zuzuschreiben sind, bei.

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Recently the blood-pressure of a middle-aged clergyman was taken continuously for several hours. During this examination this clergyman, who had been a war chaplain, began telling of some of his experiences in France. His blood-pressure during the recital of these exploits ran from 180 to 190. When he described his more peaceful experiences with the Army of Occupation, the beauty of the Rhine, the boat-rides up the river, the quiet hours spent in the terrace restaurants looking out over the castle and sipping the delicious Rhine wine, his pressure fell to normal. Then he recalled that he must officiate at a funeral the following day and wondered just what he should say. Up went the pressure again.

—*Major*

Total Gastrectomy

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AND M. SAKAI, M.D.

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Twenty-two cases of gastric carcinoma in which total gastrectomy was performed constitute the basis of this study. The authors divide the cases into two series: Series A, in which continuity of the alimentary tract restored by esophagojejunal anastomosis, and Series B, in which continuity was restored by transplanting a loop of jejunum between the esophagus and the duodenum. In the authors' hands the latter method proved to have several advantages over the former.

The abdominal approach was used in 16 cases and the thoracoabdominal in 6.

In the authors' opinion, total gastrectomy is indicated only when removal of all malignant tissue is possible and should never be resorted to for palliation.

SURGICAL treatment of gastric carcinoma by total removal of the stomach remains a much discussed subject.

As the operative mortality rate has been greatly diminished, this operation is now considered, by many authors, the method of choice. The reduction in the operative mortality rate is due to the general progress of medicine (transfusion of blood, discovery of antibiotics, etc.) and to improvement of the various technical procedures.

Of great importance is the early diagnosis of gastric carcinoma. Recently many new diagnostic methods have been introduced, involving radioisotopes (Nakayama), smear tests (Papanicolaou), photographic investigation with the gastrocamera (Hayshida) and retrograde and balloon gastrocameral films (Nakayama).

In Table 1 are listed the operative mortality rates reported by surgeons of various nations.

Although the operative risk has decreased, there always remains the question: "Is total gastrectomy really the method of choice for surgical treatment of gastric carcinoma?"

There are many surgeons who advocate total gastrectomy in all cases of carcinoma of the stomach (Pack, McNeer, Watkins, West, Herter and others).

The more conservative surgeons confine its indications to extensive carcinoma or its localization at the gastric cardia (Marshall, Fretheim, Holemback, McDonald, Garlock and others).

This article was not written to emphasize the mortality rate associated with total gastrectomy, because it is now well known to be relatively low, but to communicate our experience with this method and to describe the operative technic employed.

It should be mentioned that we count as cases of total gastrectomy only those in which the pathologist, on examination of the specimen, has noted normal esophageal tissue on one end and duodenal tissue on the other.

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Submitted for publication Jan. 30, 1959.

TABLE 1.—*Mortality Rate: International Data*

Author	Date of Study	No. of Cases	Mortality Rate %
Finsterer	1950 (1913-1940)	37	79.2
Finsterer	1950 (1940-1949)	103	49.5
Pack and McNeer	1913 (1897-1942)	298	37.6
Herter and Auchillos	1957 (1940-1953)	91	31
Lefevre and Lortat-Jacob (from 34 authors)	1950 (—)	996	29
Allison and Borrie	1947 (—)	24	29
Amuri-Paolini and Marinoni	1955 (1948-1954)	50	28
Walters and others	1953 (1917-1948)	185	27
McNeer and others	1956 (1951-1955)	80	26
Fretheim	1955 (1946-1952)	178	17.4
Garlock	1953 (1940-1951)	24	16.7
Brintnall and others	1956 (1946-1954)	58	15.5
Sweet	1953 (1941-1952)	84	15
Walters and others	1953 (1948-1950)	62	12.9
Scott and Longmire	1949 (1944-1948)	63	9.5
Marshall	1956 (1944-1955)	202	8.7
Wangensteen	1949 (—)	28	5.3
West and Fenger	1952 (1949-1951)	39	5.1
Sensening and Campbell	1957 (—)	22	4.5
Nakayama	1957 (1946-1956)	526	2.9

In all our cases total gastrectomy was combined with splenectomy and partial left pancreatectomy. In our opinion it is necessary, for technical reasons, to resect the spleen; first, to mobilize the upper part of the stomach and to check the hemorrhage, and second, to remove the predictably involved glands of the hilum (Fly, 1956). We perform partial pancreatectomy to facilitate excision of the pancreatosplenic lymph glands, which are often involved.

As a routine we start with an abdominal incision from the umbilicus to the xiphoid, and if the lesion is located at the cardia and infiltrates the lower part of the esophagus we add a left thoracic incision through the fifth or sixth interspace by dividing or resecting the left costal margin. We do not explore the chest when distant metastases are present.

We start feeding our patients by mouth on the fifth postoperative day. We do not use an indwelling nasal tube, being afraid of a possible rupture of the esophagojejunal anastomosis. During the first postoperative days we feed our patients by the parenteral route, and of course we look after the electrolytic balance in every case.

From 1950 to 1958, 135 patients were admitted to our hospital with gastric carcinoma.

From Table 2 it is obvious that subtotal gastrectomy is associated with a comparatively high operative mortality rate, but this was due to the fact that in some cases the operation was performed for palliation only.

The 22 patients subjected to total gastrectomy were separated into two series. With each of these we employed a different operative technic for restoration of the continuity of the alimentary tract.

Series A.—This series includes 14 patients subjected to total gastrectomy. In

TABLE 2.—*Surgical Treatment and Results*

Type of Operation	Cases	Deaths
Inoperable	44	1
Gastrojejunoanastomosis	20	2
Subtotal gastrectomy	49	14
Total gastrectomy	22	2
Total	135	19

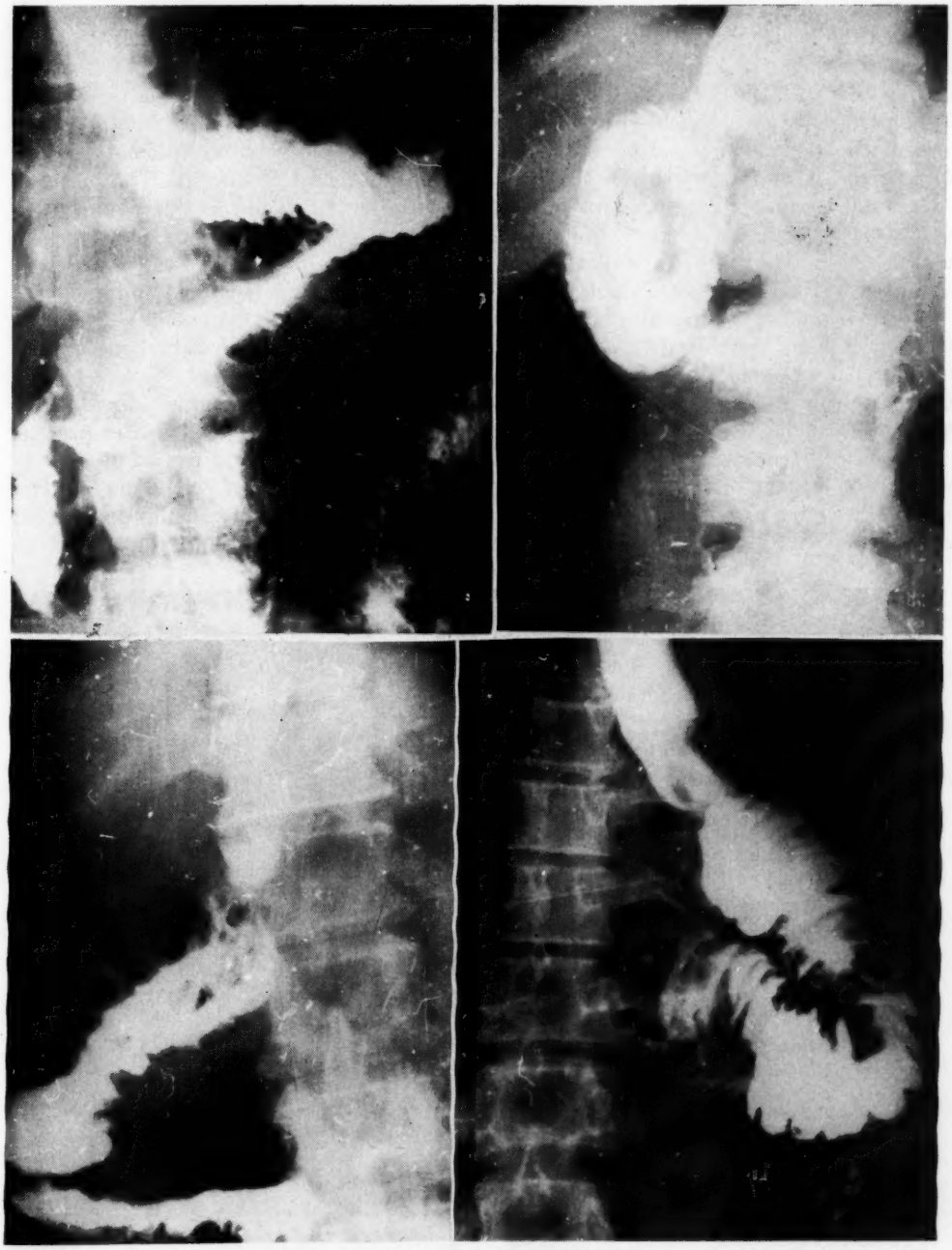

Fig. 1.—Artificial stomach created by transplantation of a jejunal loop (Nakayama's method).

6 of these, adenocarcinoma of the cardia involved the lower part of the esophagus, the cardioesophageal lymph nodes and the lymph nodes of the hilus of the spleen. One of the 6 patients had been previously operated on (typical subtotal gastrectomy) for carcinoma of the pylorus.

In the remaining 8 cases the growth involved the body of the stomach. In 9 cases the abdominal approach was followed; in the other 5, the thoracoabdominal.

Reconstruction of alimentary continuity in 7 patients was established by the Roux en Y anastomosis and in the remaining 7 by end-to-side esophagojejunostomy with the Braun anastomosis.

Two deaths from peritonitis occurred as a result of leakage of the anastomosis. In these 2 cases the abdominal approach was employed.

The survival period in this series was more than five years for 2 patients, three years for 3 and, for the rest, between six months and a year and a half. We kept in contact with all patients who presented any of the following symptoms:

1. Postoperative anemia. This was seldom observed in our patients, and when it was, it was caused by iron deficiency. This complication was favorably influenced by administering iron and folic acid.

2. Steatorrhea (2 patients) and diarrhea (in 1). These disturbances were treated with drugs that diminished the mobility of the alimentary tract (Banthine, etc.) and with food rich in proteins and carbohydrates and devoid of fat.

3. Regurgitation of bile. This occurred in 3 patients without causing esophagitis.

4. Dumping syndrome. This was en-

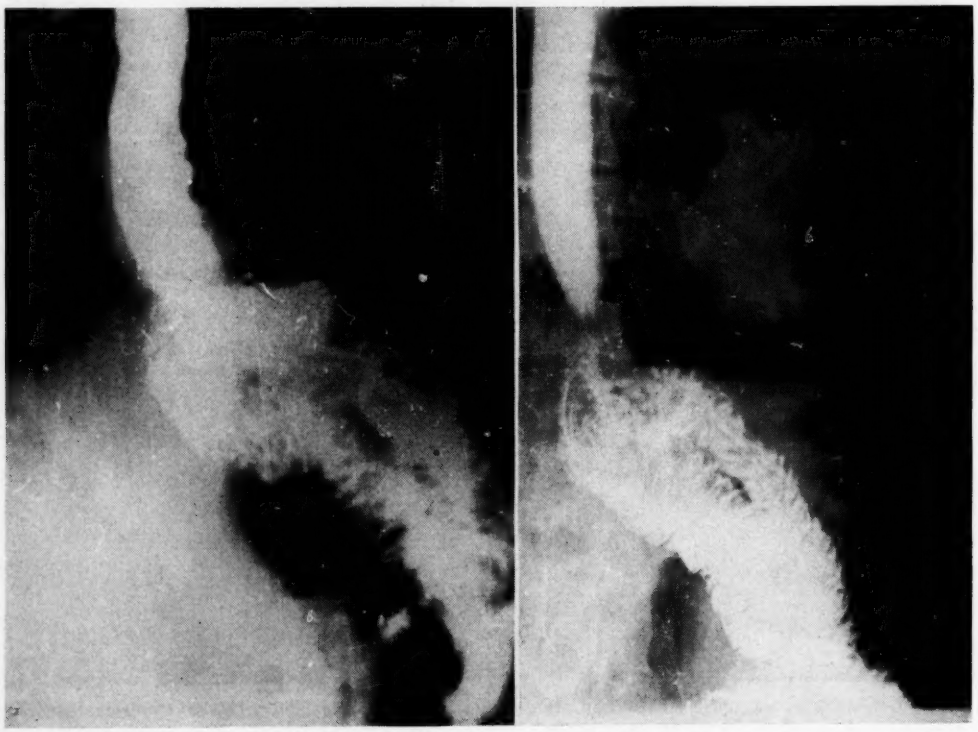

Fig. 2.—End-to-side esophagojejunal anastomosis.

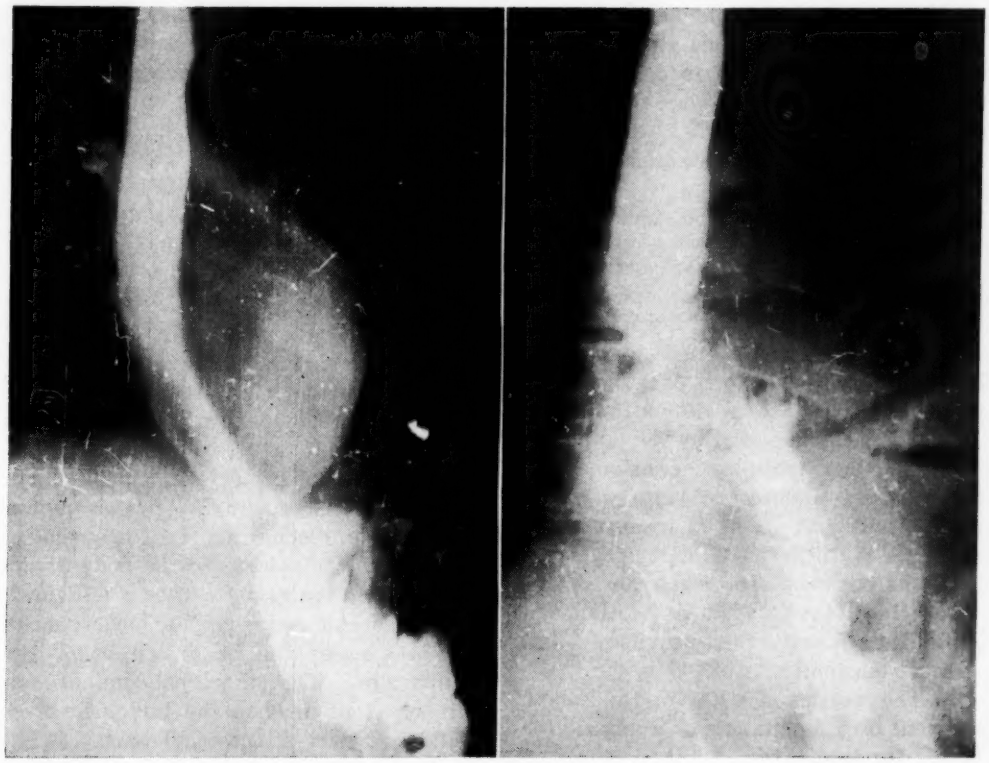

Fig. 3.—Roux en Y anastomosis.

countered in 1 case.

5. Edema of the lower limbs. In 2 cases, three and six months respectively after the operation, this complication was observed.

6. Difficulty in restoring preoperative weight. One third of our patients had this trouble.

The megaloplastic anemia mentioned by many authors did not occur in our patients, probably owing to the regular administration of vitamin B_{12}. Nor did diabetes develop in any of them, even though the tail and body of the pancreas had been removed.

Series B.—In this series are included patients subjected to total gastrectomy during the past six months for carcinoma of the stomach. In 2 cases the tumor was situated at the cardia; in the remaining 6 the growth involved the body of the stomach and the prepyloric region, with metastasis to the regional lymph nodes. The thoracoabdominal approach was employed in 1 case and the abdominal in all the rest.

The continuity of the alimentary tract was restored by interposition of an intestinal segment (jejunum), 15 to 20 cm. long, between the esophagus and the duodenum. The upper end of the isolated jejunum was anastomosed end-to-side with the loop (Nakayama's method). This loop was anastomosed end-to-end with the duodenum.

Although we have been employing this technic for a short time only, we are satisfied with it, for the following reasons:

1. Physiologic passage of the food by the duodenum is restored.

2. Regurgitation of bile does not occur.
3. The operative technic allows the patient a greater intake of food in the artificial stomach than is possible with a simple esophagojejunostomy.
4. No dumping syndrome was observed.

COMMENT ON OPERATIVE TECHNIC

Comparing the operative methods we have used in our two series, we conclude that interposition of an intestinal loop between the esophagus and the duodenum, in spite of the additional anastomosis, is preferable. The reasons are as follows:

1. It is well supported by the patient.
2. The esophagojejunal anastomosis is much safer. Indeed, no rupture of the anastomosis was observed in any patient in Series B. In Series A, on the contrary, 2 deaths occurred from this cause. This we ascribe to the fact that in the esophagojejunal anastomosis the sutures are joined without tension.
3. The creation of a loop on the isolated segment of jejunum acts as a gastric reservoir for food.
4. The interposition of the intestinal loop maintains normal passage of the food through the duodenum.
5. Regurgitation of bile and the dumping syndrome are eliminated, judging from the results in this series.

CONCLUSIONS

Total gastrectomy is the most radical surgical procedure for the treatment of gastric carcinoma. As a surgical method it has certain advantages and disadvantages. Nowadays the principle that governs the surgical treatment of carcinoma is radical extirpation of the malignant lesion. Total gastrectomy approaches this principle more closely than does subtotal gastrectomy.

In our opinion, this operation should be performed only in cases in which complete removal of all malignant tissue is possible; it should never be used as a palliative method. The success of such a major intervention depends greatly on the quality of postoperative care.

The indication for total gastrectomy in cases of pyloric carcinoma is the fact that the malignant elements are diffused, by submucous extension, through the entire stomach. Thus, 2 of our patients who underwent typical subtotal gastrectomy presented a recurrence in the gastric stump after six months. In 1 of the 2 cases we were able to perform total gastrectomy, after which the patient survived for a year and a half.

Our choice of an incision depends upon the site of the growth. We prefer the abdominal approach when the tumor is located near the pylorus or the body of the stomach. If the vagus nerves are divided, a considerable portion of the lower part of the esophagus can be drawn below the diaphragm. The thoracoabdominal approach is used when the tumor involves the lower part of the esophagus.

We are convinced that the interposition of an intestinal loop (jejunum) to reestablish alimentary continuity presents many advantages.

RÉSUMÉ

Les auteurs analysent 22 cas de cancer de l'estomac, traités par gastrectomie totale. Ils marquent deux décès.

Entre les deux methodes chirurgicales qu'ils ont utilisées pour le retablissement de la continuité du tube digestif, ils prefèrent celle de l'interposition de l'intestin grêle entre l'esophage et le duodenum.

RIASSUNTO

Gli autori analizzano 22 casi di cancro dello stomaco, trattati con gastrectomia totale. Notano due deccessi. Fragli due methodi chirurgiche che hano utilizzato per il ristabilimento della continuito del tubo

digestivo, preferiscono quella del interposizione del intestino tenue fra l'esofego e il duodeno.

ZUSAMMENFASSUNG

Die Autoren analysieren die Resultate von 22 Fällen von Magenkarzinom, die mit totaler Gastrektomie behandelt wurden. Zwei Todesfällen erfolgten.

Von den zwei Verfahren zur Herstellung der angewandten Kontinuität, wird von ihnen die Interposition einer Jejunalschlinge zwischen Oesophagus und Duodenum bevorzugt.

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In all diseases of the lungs, running at the nose and sneezing is bad, whether it existed before the illness or supervened during its course. But in other diseases which are likely to prove fatal, sneezing is beneficial. In cases of pneumonia, the production at the beginning of the illness of yellow sputum mixed with a little blood is a good indication of recovery. But when this occurs on or after the seventh day, it is less certainly good. All sputa are bad which do not relieve the pain; the worst are those which are dark in colour as stated above. The production of any sputum which relieves pain is rather better.

—*Hippocrates*

Hernia in Infants

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Inguinal hernia in an infant, male or female, should be operated on as soon as it is discovered. Often the patient can be ambulant. A thorough knowledge of the anatomic aspects of the inguinal region is a sine qua non. Local anesthesia may be employed for the operation, and a waterproof dressing should be applied. If the patient is carefully followed, there should be no recurrence of the hernia.

At present the use of any retentive apparatus in the treatment of inguinal hernia in an infant is considered obsolete. Whether the protrusion is small or large, the surgical correction of this defect is almost a minor procedure for a surgeon who has a real knowledge of the anatomic nature of the inguinal region and a clear concept of the descent of the funicular process, the testis and the cord, together with an appreciation of the relation of contiguous mesodermic and ectodermic structures. Years later, surgical intervention may be a major and a serious procedure, whether or not incarceration or strangulation is present.

A peculiar feature of the literature on the anatomic aspects of hernia is its tendency to use proper names instead of structural designations. The utilization of eponymic nomenclature rather than morphologic designations is hazardous and confusing, since the same proper names are frequently applied to different parts of the body, e.g., Cooper's ligament in the breast and also in the inguinal region. Claude Burton, on the other hand *(Surgery 36:106-116, 1954)*, has offered excellent morphologic terms for the inguinal region and hernia, completely eliminating eponyms (Fig. 1).

The aphorism "Delays breed danger" has special relevance to the infant afflicted with hernia. Surgeons are cognizant of the painstaking care required, the emotional strain of the parents due to apprehension of incarceration or strangulation, the doubtfulness of cure and the awareness of a genital abnormality. In general, the burdensome effects of truss treatment of infantile hernia can be well appreciated. The association of an undescended or ectopic testis confirms these statements. Dependence on these erroneously termed ameliorative mechanical measures may result in serious sequelae and may lead to complicating results, such as incarceration and testicular atrophy. Operation should be performed as soon as the diagnosis is made, regardless of the child's age and whether or not the situation is complicated by maldescended or ectopic testes or hydrocele of the cord or testis.

Etiologic Factors. — Heredity accounts for at least 25 per cent of all varieties of inguinal hernia, especially in infants and older children. A. C. Birkenfeld *(Arch. f. klin. Chir., 1930)*, stated that the familial congenital predisposition is four times as great in men as in women. Peritoneal protrusion through the deep or abdominal inguinal ring should be oblit-

Submitted for publication Nov. 3, 1958.

erated in the newborn, possibly as a result of the descent of the testis, sometimes prenatally, through its entire extent except for the part that envelops the testicle, called the tunica vaginalis. The part that parallels the spermatic cord is the funicular process. If this is not obliterated prenatally a direct communication remains from the peritoneal cavity, which allows the abdominal viscera to descend into the thin peritoneal diverticulum. When the lumen of the funicular process in its upper two-thirds remains patent, the proximal part becomes a congenital funicular hernia. When the lumen of the funicular process is obliterated in its proximal extent, fluid may accumulate in the more distal portion of the process and in the tunica vaginalis of the testis, forming a hydrocele. The lumen of the process may be obliterated at each end but remain open somewhere in its extent. When fluid accumulates here, it forms a hydrocele of the spermatic cord.

During the ninth month, after the descent of the testis has been completed, the processus vaginalis is occluded in two situations, at the annulus inguinalis profundus and immediately above the testis; the intervening part, normally, eventually becomes obliterated. A patent process that communicates with the abdominal cavity is the basic etiologic factor in the development of an inguinal hernia, congenital or acquired. Patency between the two sites of obliteration is the factor predisposing to hydrocele of the spermatic cord.

The preponderant incidence of indirect inguinal hernia in the male is due to many embryologic as well as anatomic factors, to wit: (1) the greater incidence of an imperfectly closed processus vaginalis in

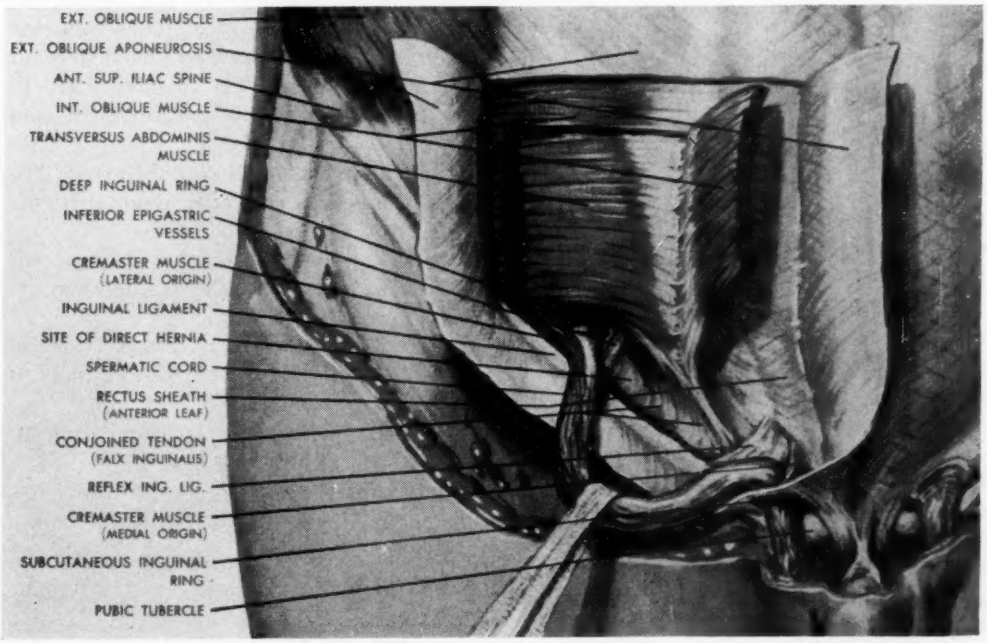

Fig. 1.—From article "Inguinal and Femoral Hernias," by Alfred H. Iason, M.D., Ciba Clinical Symposia, vol. 7, No. 2, March-April 1955. Permission for reproduction granted by Ciba Pharmaceutical Products, Inc.

men than in women; (2) the descent of the testicle, and (3) the requirement for a larger aperture at the abdominal ring for the exit of the spermatic cord. In the early years of life the inguinal region, among other peculiarities, presents not only a very short inguinal canal, with the annulus inguinalis profundus directly opposite the annulus inguinalis subcutaneous, but defects due to maldescent of the testis and of nonobliteration, or partial closure, of the tunica vaginalis (Fig. 2).

Factors that increase intra-abdominal pressure, such as excessive crying, constipation, straining, coughing and phimosis, are frequent secondary causes.

The importance of these factors is greatest in the newborn child. Indubitably, in a large proportion of infants, closure of the processus vaginalis, incomplete at birth, finally occurs when the children are a few months old. During the interval any unusual increase of intra-abdominal pressure favors the development of an inguinal hernia by causing dehiscence between the poorly agglutinated walls of the tunica.

An infant with a left-sided inguinal hernia has an even chance of soon revealing one on the right side. This is not true of a right-sided hernia. The greatest incidence of hernia is on the right side in the first three months of life.

Pathologic Picture. — In infants and older children the vast majority of hernias are of the oblique or indirect type. The minority reveal other varieties, usually with one or more of the following associated conditions: (1) extroversion of the bladder, complicated by direct inguinal hernia; (2) undescended testis with an inguinal hernia, in which the sac is proparietal, and (3) ectopia testis, in which the hernial sac may trail the aberrant testis.

Congenital Inguinal Hernia: In this variety the hernial sac leaves the abdomen, preceding various structures of the spermatic cord, and passes through the abdominal wall along the inguinal canal, appearing on the surface through the subcutaneous ring. In this group are the following subgroups: (1) bubonocele, so-called because the sac is commonly observed at the usual site of buboes — an incomplete hernia confined to the region of the annulus inguinalis profundus; (2) inguinal, in which the protrusion is lodged completely or partly within the inguinal canal. The tunica vaginalis of the testis does not communicate with the patent tunica vaginalis of the hernia, and (3) scrotal, with the hernia passing through the annulus inguinalis subcutaneous and filling part or all of the scrotal sac. There is continuity of the lumens of both the testicular and the cord tunicae (Fig. 2).

Contents of the Hernial Sac: The small intestine is the most frequent content of the sac. Omental contents are uncommon in children, because at an early age the omentum has not reached the degree of development it assumes in later life. In the female an ovary is frequently contained.

Components of an Inguinal Hernia: The components of a complete inguinal hernia are:

The Sac	Mouth: the path between the lumen of the sac and the abdominal cavity. Neck: the narrow section between the mouth and body of the sac. Body: the portion lying beyond the neck.
The Contents	1. Omentum 2. Intestine 3. Other viscera or parts thereof 4. Fluid 5. Ovary (in the female) 6. Various loose bodies

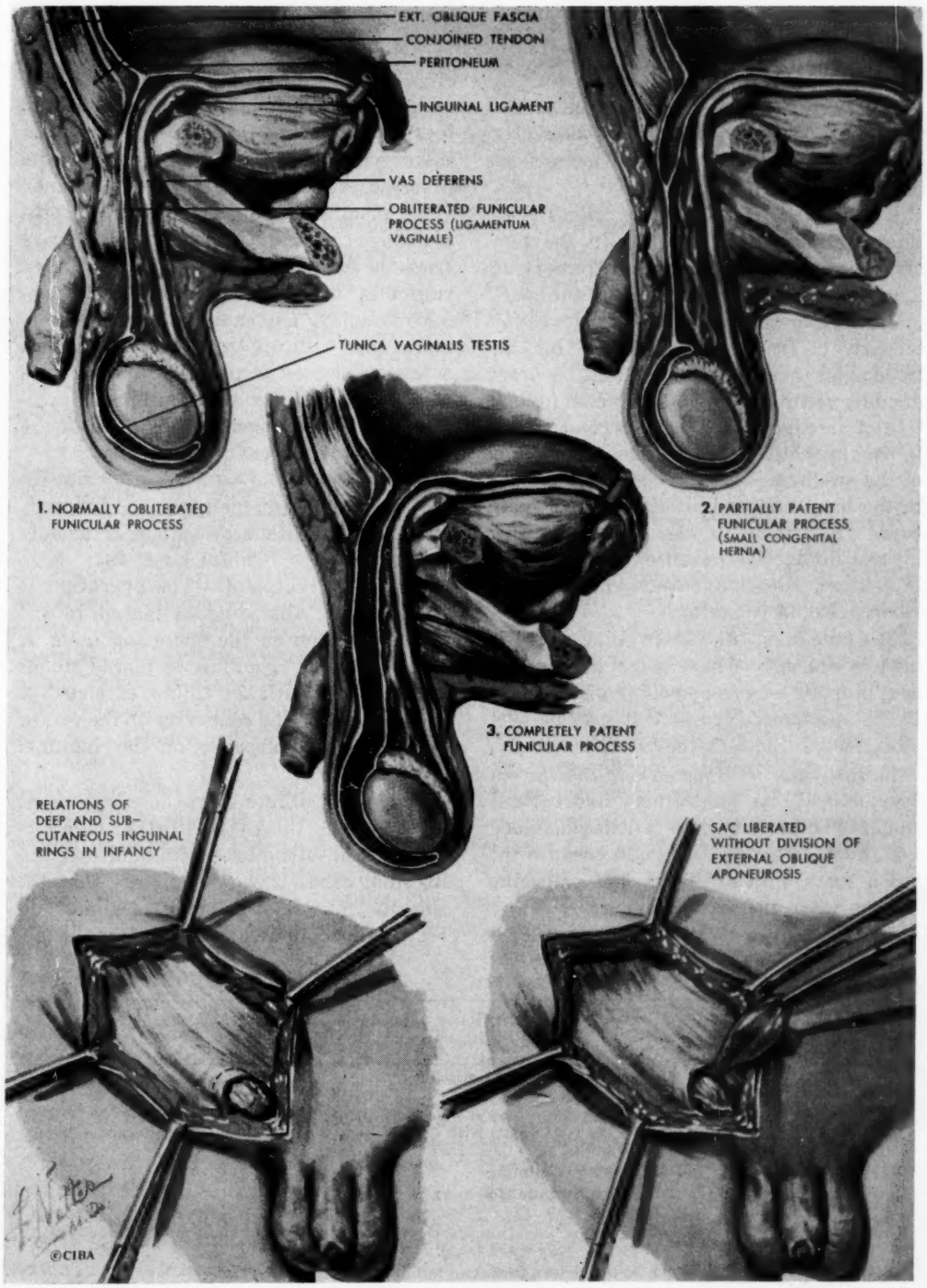
EXT. OBLIQUE FASCIA
CONJOINED TENDON
PERITONEUM
INGUINAL LIGAMENT
VAS DEFERENS
OBLITERATED FUNICULAR PROCESS (LIGAMENTUM VAGINALE)
TUNICA VAGINALIS TESTIS
1. NORMALLY OBLITERATED FUNICULAR PROCESS
2. PARTIALLY PATENT FUNICULAR PROCESS (SMALL CONGENITAL HERNIA)
3. COMPLETELY PATENT FUNICULAR PROCESS
RELATIONS OF DEEP AND SUB-CUTANEOUS INGUINAL RINGS IN INFANCY
SAC LIBERATED WITHOUT DIVISION OF EXTERNAL OBLIQUE APONEUROSIS
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Fig. 2.—From article "Inguinal and Femoral Hernias," by Alfred H. Iason, M.D., Ciba Clinical Symposia, vol. 7, No. 2, March-April 1955. Permission for reproduction granted by Ciba Pharmaceutical Products, Inc.

Differential Diagnosis.—Certain conditions may offer difficulty in the diagnosis of congenital inguinal hernia. They are as follows:

1. *Encysted Hydrocele of the Cord:* There is a localized swelling in the line of the spermatic cord, apparently part of it, and irreducible. A hydrocele of the spermatic cord or the canal of Nuck, its counterpart, is frequently mistaken for an irreducible hernia. The swelling is irreducible, yet there are no symptoms indicative of irreducibility. The spermatic cord is usually palpable above the upper limit of the swelling. The mass is movable, both in the long axis and across the spermatic cord. Hydrocele of the spermatic cord gives a distinctive sensation on palpation. It is tense, smooth and fluctuant. There is no impulse on coughing.

2. *Lipoma of the Cord:* A swelling is always present. There is no impulse on coughing. The mass is medial and inferior to the spermatic cord, and it may be possible to differentiate the latter structure.

3. *Intermittent Hydrocele of the Tunica Vaginalis:* When an ordinary hydrocele is under examination there is little likelihood of a mistake in the diagnosis, because the mass rests entirely below the palpating fingers when the spermatic cord is grasped. When an intermittent hydrocele is under consideration, however, in addition to the hydrocele of the tunica vaginalis there will be incomplete closure of the processus vaginalis, the degree of patency being insufficient to permit a hernial protrusion yet sufficient to permit fluid to pass from the abdominal cavity into the tunica vaginalis. There is a history of intermittent swelling. On examination the spermatic cord will appear enlarged. Though a thickened cord is palpable, its width is never increased by the contiguous presence of abdominal contents. The size of the swelling varies from time to time.

4. *Undescended Testis:* The hernial tumor is elastic and painless on pressure, while an undescended testicle is usually firm and tender *(Tables 1 and 2)*.

Surgical Treatment.—The operation is facilitated if the child is placed in the proper position on the operating table. A small sandbag or pillow is placed under the buttocks, with the thighs extended so as to overcome the concavity of the groins and facilitate exposure of the inguinal structures.

The infant differs from the adult in that there is no weakness in the musculoaponeurotic structures. In addition, the inguinal canal is very short, so that the subcutaneous inguinal ring is almost directly superimposed on the deep or ab-

TABLE 1.—*The Differential Diagnosis of Reducible Inguinal Hernias and Congenital Hydroceles*

	Complete Reducible Inguinal Hernia	*Congenital Hydrocele*
Location	Swelling continuous with inguinal region	Same as in inguinal hernia
Impulse	Distinct on coughing	No
	Not translucent, as a rule; rarely so in children	Translucent
When reduced	Gurgling of intestine heard under pressure; reappears rapidly	Reduction and reappearance slow
Relation to testes and spermatic cord	Lies above or anterior to testis	As in hernia
Palpation and percussion	Soft, semi-elastic; dull, if omentum; traumatic if intestine	Harder and tenser; dull on percussion

TABLE 2.—*The Differential Diagnosis of Reducible Scrotal Swellings*

	Hernia	*Congenital Hydrocele*
Age	Occurs at all ages	Infancy
Appearance	Pyriform	Pyriform
Tactile sensation	Soft; semielastic	Hard; elastic
Impulse on coughing	Definite; expansile	Usually absent; slight, if present
Translucency	Nontranslucent in adult; may be translucent in infants	Translucent
Fluctuation	None	Present
Percussion	Resonant, if intestine; dull, if omentum	Dull
Auscultation	Gurgling if intestine is present	Dumb
On reduction by taxis	Feeling of solid, slipping body	Prolonged period for fluid to be cleared
Change on assuming supine position	Will not reappear	Will reappear, but slowly

dominal inguinal ring. It is unnecessary, therefore, to divide the external oblique aponeurosis to obtain exposure of the short inguinal canal and its contents and so facilitate repair. It is also unnecessary to do a hernioplasty. A simple herniorraphy is all that is required.

In the male infant the initial skin incision is parallel to and over the inguinal ligament from the pubic tubercle laterally for three-fourths of the distance toward the anterior superior spine. With Allis clamps applied to the skin margins for traction the superficial epigastric and superficial pudendal vessels are visible between Camper's and Scarpa's fascia, more properly described as the superficial and deep layers of the superficial fascia. These vessels are clamped and ligated before division of the fascia to expose the external oblique aponeurosis and the external or subcutaneous ring. The cord and sac, and at times an extraperitoneal lipoma, are then observed, enveloped in the internal spermatic and cremasteric fascia. (Care must be taken to avoid injury to the three nerves in the inguinal canal—the iliohypogastric, ilioinguinal and genitocrural nerves.) The two membranes are then divided by careful blunt dissection over the cord. The sac, identified by its glistening grayish yellow color, is slightly adherent to the superomedial surface of the cord, extending a variable distance toward the scrotum and at times down through a hiatus in the superficial fascia, termed by McGregor the third inguinal ring. Its patency is usually not continuous with the sac of the tunica vaginalis of the testis. Extraperitoneal lipomas are infrequent in infants and are easily dissected free, ligated at their proximal extremities and excised.

The sac, usually empty and thin, is clamped at its distal end and carefully separated from the cord by fine clamp and digital manipulation down to the deep ring. Meticulous care must be taken not to injure the vas deferens, which can be easily seen or palpated postero-inferior to the cord. The same applies to the deferential and internal spermatic vessels. The sac is carefully palpated first to determine its contents (usually intestine or omentum), which should be reposited into the peritoneal cavity. If any difficulty is encountered because of partial obstruction at the abdominal inguinal ring, the narrowing may be overcome by dilation with a small clamp or by digital pressure lateral to the

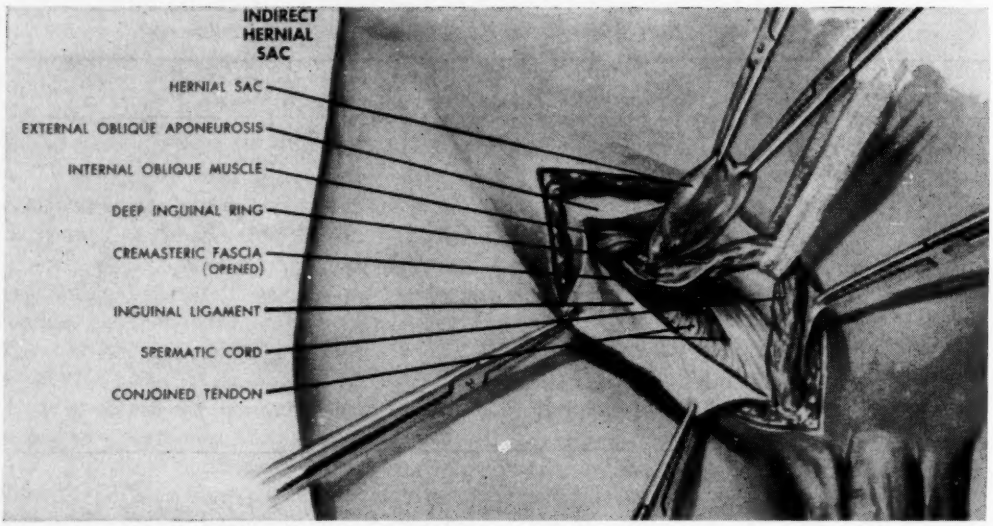

Fig. 3.—From article "Inguinal and Femoral Hernias," by Alfred H. Iason, M.D., Ciba Clinical Symposia, vol. 7, No. 2, March-April 1955. Permission for reproduction granted by Ciba Pharmaceutical Products, Inc.

neck of the sac, to avoid damage to the inferior epigastric vessels medial to it (Fig. 3).

The sac is then opened between the two clamps previously applied, and its interior is inspected. Any adhesions between the contents and the wall are separated by careful blunt digital or sharp dissection to permit reduction. The sac is then twisted on itself and ligated or transfixed at its neck just distal to the deep ring while traction is made on the sac. The neck also is always identifiable by an extraperitoneal contiguous pad of fat. It is untwisted while one applies the second knot to facilitate closure, and the sac is removed by severing it about ⅜ inch (0.9 cm.) distal to the ligature, leaving an adequate stump to retract into the abdominal cavity. It is unnecessary to use subcutaneous superficial sutures. The skin is approximated with fine black silk sutures, interrupted in the manner of Stewart.

TABLE 3.—*Data on a Total of Five Hundred Cases*

Sex	
Male	471
Female	29
Age	
Under 6 months	350
Over 6 months	150
Side	
Right	265
Left	185
Bilateral	50
Results	
Recurrences	2

Inguinal Hernia in the Female Infant.—An inguinal hernia in a female infant is rare. The sac is usually small and pear-shaped and lies on the ventral surface of the ligamentum teres, to which it is quite firmly agglutinated. It usually contains an ovary and may contain oviduct, omentum and intestines. Occasionally, when the sac is large, the body of the uterus may invade its lumen. The canal of Nuck (analagous to the processus vaginalis) normally becomes obliterated at the end of the eighth intrauterine month.

There are three conditions that may simulate inguinal hernias in the female:

1. Hydrocele of the canal of Nuck. This is similar to a hydrocele of the cord in the male. It resembles an irreducible hernia containing an ovary.

2. Enlarged inguinal lymph nodes, which may be diagnosed by their position.

3. Femoral hernia, which may be differentiated because of its relation to the pubic spine.

The surgical procedure for inguinal hernia in the female is almost the same as in the male. The round ligament or ligamentum teres is treated in a manner similar to that employed for the spermatic cord. If the sac is too intimately adherent to the round ligament like a visceral layer of peritoneum, one may transfix the sac and its neck, even including some of the round ligament in the suture ligature, then removing the sac distal to the cord. There is no danger in leaving some "visceral" portion of the sac attached to the round ligament. Should it become necessary to remove some of this ligament, the proximal and distal portions may be approximated with chromic catgut.

ZUSAMMENFASSUNG

Leistenbrüche bei Kleinkindern beiderlei Geschlechts sollten sofort nach ihrer Entdeckung operiert werden; die Patienten können oft ambulant bleiben.

Eine genaue Kenntnis der anatomischen Verhaltnisse der Leistengegend ist eine Voraussetzung *sine qua non*. Localanästhesie kann verwendet werden. Wasserdichte Verbände werden benutzt. Bei sorgfältiger Überwachung dieser Fälle sollten Rückfälle nicht vorkommen.

SUMARIO

As hernias inguinais das crianças meninos ou meninas, devem ser operadas tão cedo quanto são diagnosticadas. Um conhecimento completo da anatomia de região e uma condição *sine qua non*. Pode ser usada a anestesia local. Se os casos são cuidadosamente acompanhados não havera recidivas.

RÉSUMÉ

Les hernies inguinales de l'enfance (pour les deux sexes) devraient être opérées dès le diagnostic posé; souvent ce traitement peut être ambulatoire.

Une connaissance approfondie des aspects anatomiqus de la région inguinale est une condition *sine qua non*. On peut recourir à l'anesthésie locale. Un pansement imperméable est appliqué. Si ces cas sont attentivement suivis ils devraient être exempts de récidive.

RESUMEN

Los hernias inguinales de los niños, o niñas, deben ser operadas tan pronto como se descubran. A veces puede hacerse tratamiento ambulatorio.

El dominio de la anatomía de la región por parte del cirujano es condición sine qua non. Puede emplearse la anestesia local. Se coloca un apósito impermeable. Si estos casos se atienden cuidadosamente no suele haber recidiva.

In seeking absolute truth we aim at the unattainable, and must be content with broken portions.

—*Osler*

Genitourinary Surgery

Hypernephroma of Horseshoe Kidney

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HORSESHOE kidney is the most common form of renal fusion. Necropsy reports of its occurrence vary from 1:600 to 1:1800. Its clinical incidence is estimated at 1:200, while in pyelographic series reported by Judd, Braasch and others[1] it is 1:142. As a congenital anomaly it is, naturally, encountered in persons of all ages, occurring, for some reason, more often in the male than the female, the ratio being about 4 to 1. Prior to the use of pyelographic study the preoperative diagnosis of this condition was practically unknown, though a few clinicians with wide experience, such as Israel,[2] Martinow,[3] Rovsing,[4] and others had occasionally reported cases in which the diagnosis had been made merely by palpation.

Read at a meeting of the Chicago Urological Society, Jan. 28, 1959.
Submitted for publication Feb. 1, 1959.

A case of hypernephroma arising within one half of a horseshoe kidney and with a renal calculus on the same side is described, and its clinical and surgical features are discussed. The patient's survival of seven years, without any manifest metastases following heminephrectomy, is emphasized. A search of the available literature suggests that such a clinical entity is rare.

Although horseshoe kidney may be regarded as a normal organ for the person who has it, it is the consensus that any anomalous organ is more liable to pathologic changes than is a normal one, and horseshoe kidney is known to be associated with a higher incidence of disease than is a normal, nonfused organ. Botez[5] (*Journal d'Urologie*), reporting on 320 cases collected from the literature, stated that in 52 there was some pronounced renal pathologic change. In more than half of the cases observed post mortem by Meredith Campbell[6] there was advanced renal disease. Such a high percentage of uropathic conditions is primarily accounted for by (1) the abnormal, ectopic position of the renal pelves; (2) the course of the ureters lying over the isthmus; (3) the liability of the pelves and the ureters to partial obstruction by the aberrent vessels, and/or (4) fixation of the fused kidney by its isthmus to the surrounding structures.

Clinically, horseshoe kidney may exist over a period of years, even a lifetime, producing no symptoms whatever, only to be encountered at autopsy or discovered accidentally during routine urologic examination or on the operating table during some abdominal exploration. Lowsley[7] has stated that anomalous kidneys, whether horseshoe or ectopic, usually show no symptoms unless diseased, even though they drain defectively and are poorly nourished owing to the inefficiency of their

anomalous vascularization. There are no pathognomonic or characteristic signs or symptoms of horseshoe kidney. The textbooks mention Rovsing's sign (the production of renal pain by spinal retroflexion and relief by antiflexion), but this probably has little diagnostic significance. Gutierrez,[8] in his classic monograph "The Clinical Management of Horseshoe Kidney," mentioned horseshoe kidney disease as distinct from the disease of horseshoe kidney. He stated, however, that usually, sooner or later, nephritis, pyelitis, hydronephrosis, pyonephrosis, calculi, or a combination of these will develop in such a kidney, causing death of the patient unless the anomaly and the associated lesions are properly corrected.

There is a paucity of recorded cases of renal tumors of horseshoe kidneys. Five cases reported in the literature were cited by Fahr and Lubarsch,[9] in 4 the tumors were described as sarcomas and in 1 as a carcinoma. Some additional cases have been reported since, including instances of Wilm's tumor[10] and bilateral polycystic disease.[11] Culp,[12] reviewing the records on horseshoe kidney at the Mayo Clinic from 1925 to 1952, noted only 2 in which renal malignant disease was present.

I am presenting my case because of its comparative rarity and to emphasize a period of seven years of survival after heminephrectomy, without any manifest metastases.

CASE REPORT

J. H., a white man aged 53, a patient at Manteno State Hospital whose condition was classified as schizophrenia simplex, was admitted to the pavilion of acute diseases at that hospital on Feb. 8, 1952, on account of his sudden collapse in the ward. Upon arrival he appeared acutely ill and extremely weak and apprehensive, but in good contact mentally, and cooperative. He stated that he had been passing blood in the urine and stools for about two weeks. The ward attendant also had noticed blood stains on the patient's underclothes and sheets and had reported it to the medical officer in charge. At this time the patient was referred for urologic consultation.

Fig. 1.—Characteristic flower-vase curve of the ureters and calcific shadow in region of left renal pelvis.

The temperature, pulse and respiration were normal. The blood pressure in millimeters of mercury was 130 systolic and 80 diastolic. The erythrocyte count was 2,900,000 per cubic millimeter of blood, with 55 per cent hemoglobin; the leukocyte count, 11,700 per cubic millimeter, with 85 per cent polymorphonuclears. The reflexes were physiologic. The mucosa and skin were pale and the mouth and tongue moist and red. The heart was within normal limits. There were some diffuse rales in both lungs. The abdomen was soft and not tender. On deep palpation a large, firm movable mass was encountered in the midline, below the umbilicus and extending to the left lumbar region. The liver was slightly enlarged. The right kidney could not be definitely palpated. Rectal inspection showed moderate prolapse and bleeding hemorrhoids. The external genitalia were normal except for blood staining. The prostate gland was normal in size, shape and consistency. The voided specimen was grossly bloody and contained some clots. Urinalysis

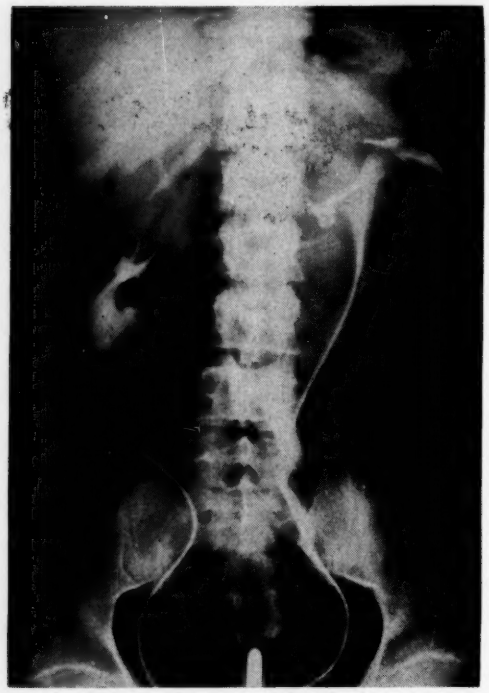

Fig. 2.—Bilateral retrograde pyelogram showing rotated kidneys and boat-shaped pelves, especially on left, with bizzare calices pointing medially and downward.

otherwise gave negative results, as did the Kahn test. The past and family histories were noncontributory.

The impression was that of marked secondary anemia, probably due to some abdominal malignant disease; rectal prolapse, and hemorrhoids.

The patient was given blood transfusions and general supportive and emergency proctologic treatment.

On subsequent examination a roentgenogram of the chest showed no evidence of active pulmonary disease. The electrocardiogram was normal.

Urologic study at this time revealed on the scout film of the abdomen a semicircular shadow crossing the third and fourth lumbar vertebrae and an area of calcification in the region of the left kidney. The shadows of the psoas muscles were visualized.

Intravenous pyelograms were quite characteristic of a horseshoe kidney. The kidney was lying nearer to the spinal column than would a nonfused organ and showed malrotation anteriorly. The pelves were elongated, especially on the left, irregular and boatshaped. They faced anteriorly, their calyces pointing mesially, while the lower calyces showed a downward and inward course. The ureters entered the pelves of the kidneys at a higher level and were farther apart than normally. A calcific shadow about 2 cm. in diameter was seen in the area of the left kidney. The right half of the kidney secreted normally, but no dye was visualized in the left renal calyces or pelvis after thirty minutes.

Cystoscopic examination disclosed a normal bladder. Both ureteric orifices were normal in their appearance and location. A clear urinary efflux was noted at the right ureteric meatus, while on the left there was grossly bloody urine. No. 5F catheters were passed easily to both kidneys (Fig. 1), and differential studies were carried out. The urine from the right side showed few white blood cells and no red blood cells. No infection was demonstrated on the smears. Urine from the left was grossly bloody. Phenolsulfonphthalein dye appeared in four minutes on the right, while only a trace of it showed in thirty minutes from the left catheter.

Retrograde (bilateral) pyelograms (Fig. 2) exhibited similar conditions and corroborated the tentative diagnosis of a horseshoe kidney, a calculus and a probable tumor in the left half.

Operation. — The kidney was approached extraperitoneally through a lumbar incision extended further anteriorly than usual, through the skin, subcutaneous fascia, muscles and transversalis fascia; Gerota's fascia was incised, separated from the kidney and retracted medially, with exposure of the kidney and the pedicle. The peritoneum was adherent to the pelvis of the kidney. It was freed by finger dissection and stripped medially.

The kidney was considerably larger and longer than normal and occupied the entire retroperitoneal space from the eleventh rib to the level of the fourth lumbar vertebra. The calculus shown on roentgenogram was palpated in the region of the pelvis. A solid mass about 3 or 4 cm. in diameter was palpated near the upper pole of the kidney. The pelvis lay anteriorly; a large renal vein crossed its upper portion, and there were several small aberrant arteries.

The isthmus was easily identified. It was lying in the midline above the promontory of the sacrum, joining the lower poles of the kidneys. It was about 3 cm. broad and felt like a thick parenchymal mass of tissue. The ureter was apparently normal and crossed the isthmus anteriorly. The ureter was freed down as far as was possible, clamped, double-ligated and divided. Palpation of the isthmus did not reveal any pulsating vessels. The vena cava was not seen, as we were working on the left side.

With a finger beneath, the isthmus was liberated beyond the midline. A mattress suture of No. 2 chromic catgut on a curved needle was placed on either side of the midline (notch) of the isthmus, a heavy right-angled clamp was placed between the sutures, and the isthmus was crushed and divided. The end of the distal stump was tied with three interrupted sutures of No. 1 chromic catgut over bits of fat for hemostasis.

Complete mobilization of the left kidney was obtained. Anomalous blood vessels entering the kidney were ligated and divided. The pedicle was freed, ligated and divided in the usual manner, and the kidney was excised. All bleeding was properly controlled. A cigaret drain was placed in the renal fossa and a rubber tube drain down to the isthmus near the ureteral stump.

The incision was closed in the routine manner, and the patient left the operating room in satisfactory condition.

Convalescence was characterized by a low-grade fever for about two weeks, after which time urinary drainage ceased. The patient was discharged from the hospital to his cottage within one month. An intravenous pyelogram was taken at that time and showed good function in the right half of the kidney.

Pathologic Report (Dr. Miriam Field).—The kidney was enlarged, weighing 225 gm. and moderately firm. On section, a calculus 1.5 by 2 cm. was observed near the lower calyx of the kidney. The midportion contained a spherical mass about 4 by 3 by 3 cm. The mass was firm and yellowish gray and was separated into lobules by firm whitish strands, radiating from a central irregular area.

Histologic examination (Fig. 3) showed large alveoli composed of clear cylindric and polygonal cells with small and deeply stained nuclei. In other places the cellular structure appeared more irregular and the cytoplasm quite compact. The cell structure was typical of a Grawitz tumor.

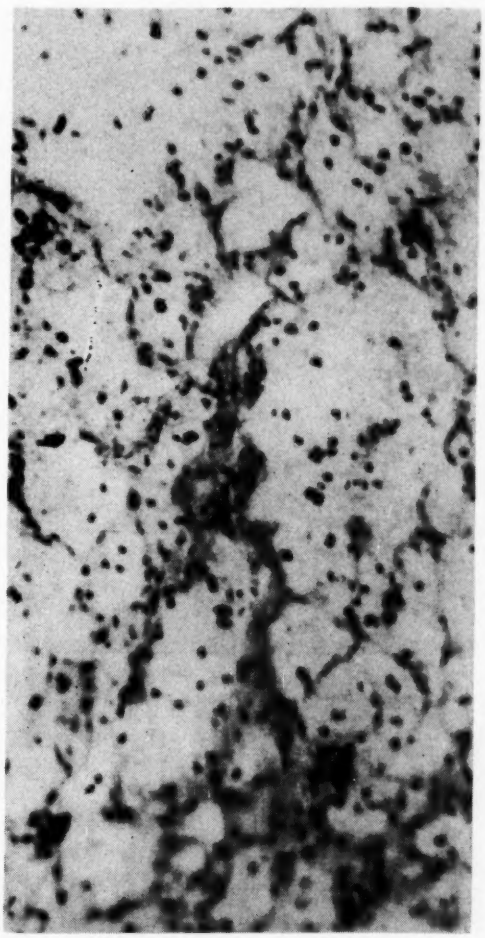

Fig. 3.—Histologic section of kidney, showing clear cell carcinoma.

On April 5, 1958, more than six years after heminephrectomy, the patient was examined at Galesburg State Research Hospital, where he is now confined. He appeared physically well and had gained considerable weight. There have been no manifest metastases. A roentgenogram of the chest showed no pulmonary disease. An intravenous pyelogram taken at this time (Fig. 4) showed the remaining right kidney normal in outline and size, with good excretory function. It also showed that the lower pole had moved upward

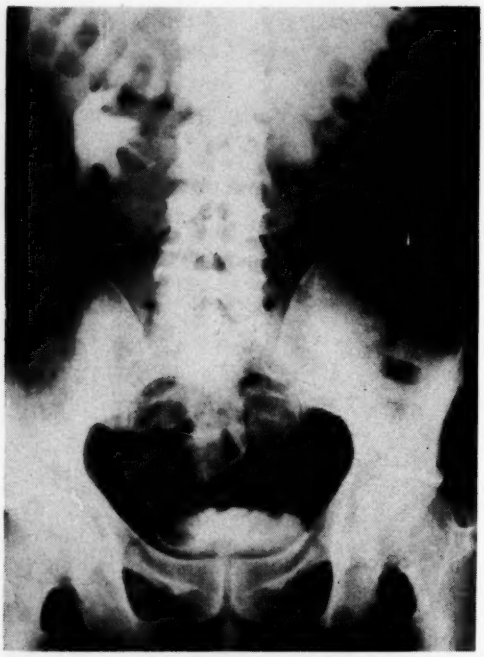

Fig. 4.—Intravenous pyelogram taken six years after heminephrectomy, showing remaining right kidney normal in outline, though still rotated anteriorly. Excretory function apparently good.

and outward and that the ureter now left the pelvis of the kidney on the medial instead of the lateral side. Urinalysis gave normal results. The blood pressure in millimeters of mercury was 130 systolic and 80 diastolic. The value for nonprotein nitrogen was 38.5 mg., and that for urea nitrogen 22 mg., per hundred cubic centimeters.

Author's Note: I wish to take this opportunity of expressing my appreciation to Dr. Lester H. Rudy, the Managing Officer of Galesburg State Research Hospital, for his valuable assistance.

ZUSAMMENFASSUNG

Es wird über den Fall eines in einer Hälfte einer Hufeisenniere entstandenen Hypernephroms mit einem Nierenstein auf der gleichen Seite berichtet, und die klinischen und chirurgischen Eigenheiten des Falles werden erörtert. Es wird hervorgehoben, dass der Patient sieben Jahre nach der Heminephrektomie ohne nachweisbare Metastasen überlebte. Eine Durchsicht der Literatur ergibt, dass es sich um einen seltenen klinischen Fall handelt.

RESUMEN

Se discuten la clínica y la cirurgía de un caso de hipernefroma aparecido en una mitad de un riñón en herradura con cálculos en el mismo lado. Se recalca la supervivencia de siete años sin manifestaciones metastáticas después de la heminefrectomía. La revisión de la literatura demuestra la rareza de este caso.

RIASSUNTO

Viene descritto un ipernefroma insorto nella metà di un rene a ferro di cavallo con un calcolo renale dallo stesso lato. Il paziente è sopravvissuto per diversi anni alla eminefrectomia, senza alcun segno di metastasi. Questi casi sono rari nella letteratura.

RÉSUMÉ

L'auteur décrit un cas d'hypernéphrome occupant la moitié d'un rein en fer-à-cheval, avec un calcul rénal du même côté, et en discute les aspects cliniques et chirurgicaux. Il signale une survie de 7 ans sans métastases manifestes, après héminéphrectomie. Une étude de la littérature semble indiquer qu'il s'agit là d'un cas rare.

SUMARIO

Descreve o caso de um hipernefroma que teve origem em uma metade do rim com calculo e discute os aspectos clinico e cirurgico. Salienta a sequencia de sete anos sem metastases apos heminefrectomia. A pesquiza bibliografica mostra que se trata de um caso raro.

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After millions of years on dry land we remain aquatic animals. We depend upon water for the ingestion, digestion, absorption, transference, synthesis, and final elimination of our food-stuffs, for the transfusion of gases across cell membranes, and for the regulation of heat—in short, for life. We can live for sixty days without food, but die in sixty hours without water. Fortunately water is everywhere available—everywhere but in the sick room. A healthy man requires about 6 pints a day; he can increase this amount with impunity, for any excess is quickly eliminated, but he cannot reduce it without danger. A surgical patient is often dehydrated before his operation. During its course he loses water by sweating, by exposure of moist tissues, and by increased pulmonary ventilation. Returned to bed, he vomits and often goes on vomiting. If he has a high temperature, persistent vomiting or diarrhoea, or an alimentary or biliary fistula, his loss of water will be very rapid. This man, already short of water, and needing far more than usual for the regulation of temperature, the metabolic processes of repair, and the elimination of the products of injury, finds himself for the first time dependent on others for its supply, and too listless to press his demands. Unless we see that he has plenty, that he takes it, and if he cannot take it that it is given to him, we shall be neglecting a primary duty, and risking the success of our operation.

—*Ogilvie*

Neurologic Surgery

Traumatic Cord Bladder and Its Management

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THE functional return was studied in 579 laminectomized patients and 279 nonlaminectomized patients who had sustained injury to the spinal cord. Five per cent recovery of vesical sensation was noted in the laminectomized group and 10 per cent in the nonlaminectomized group. Five per cent recovery of control of the bladder was noted in the laminectomized group and 7 per cent in the nonlaminectomized group.[1] Obviously, the majority of patients with injured spinal cords require urologic care in order to attain a "catheter-free state." Bors and I have written extensively about the neurogenic bladder.[2] In a recent publication Bors has covered the entire field of the neurogenic bladder with an up-to-date review of the pertinent literature.[2]

In the following paragraphs a systematic course of treatment, purely for the traumatic cord bladder, will be described as it is carried out at the Veterans Administration Spinal Cord Injury Center at Long Beach, California.

Urologic care is of paramount importance, for the life span of this type of patient is directly proportionate to the urologic involvement. The early introduction of a catheter after injury prevents overdistention of the bladder, with consequent myogenic and neurogenic damage. A No. 16 French Foley bag catheter is introduced into the bladder and is then taped to

Return of the functional balance of the bladder was studied in 579 laminectomized and 279 nonlaminectomized patients with injuries to the spinal cord, with recovery of control of the bladder in 5 per cent of the first of these groups and 10 per cent of the second. Urologic care being obviously necessary for most patients with injured spinal cords, the author outlines a systematic course of treatment for the traumatic cord bladder in the Veterans Administration Hospital at Long Beach, including a method of "bladder training." He points out that tidal drainage, widely accepted since it was popularized by Munro, is by no means infallible and does not justify the expense and labor involved in its routine use. A scout study of 118 patients under this form of treatment was made. Fifty-three (45 per cent) became catheter-free with straight drainage; 34 (29 per cent) with anesthetic blocks or transurethral resection of the vesical neck, and 31 (26 per cent) as a result of tidal drainage and/or bladder training.

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the abdomen in order to straighten out the penoscrotal angle, in an attempt to prevent penoscrotal fistula or the formation of a diverticulum. Gibbon has introduced plastic tubing of far lesser diameter than the rubber catheters used in this hospital and claims great success in the prevention of penoscrotal pathologic change.[3] Dependent continuous drainage to a bottle on the floor is started.

Further urologic care is dependent on whether a laminectomy is or is not to be performed.[1] If a laminectomy is performed early, straight drainage is maintained until the patient has recovered adequately from the operation. If a laminectomy is not performed, straight drainage is maintained until systemic shock (as against spinal shock) has disappeared and the patient is well stabilized. The quadriplegic patient is usually in skeletal traction for six weeks; consequently, straight drainage is continued during that period.

Once the patient is stabilized, a "scout" excretory urogram is taken and a cystographic study carried out. Thereafter, excretory urographic and cystourethrographic studies are performed yearly to observe the anatomic and functional states in the former instance and, in the latter, to watch for the appearance of vesicoureteral reflux and penoscrotal pathologic change. Nonprotein nitrogen blood levels are also determined on a yearly basis. Cystoscopic study is usually performed once the patient is allowed the use of a wheel chair, for it is during the bedfast period that vesical calculi usually form. Cystoscopic procedures are performed thereafter as indicated. Cystometric and sphincterometric studies are performed at intervals of three to four weeks during the first year.[5] Catheters are changed biweekly, and the bladders are irrigated, either by hand or by a closed system, with saline solution three times a day.

At this station continuous therapy, with alternate drugs in order to destroy or minimize the effect of the ever-present bacteria has not been employed. It is routine to insist, however, on 3,000 to 4,000 cc. of fluid per day. Most of these patients build up their own local tissue resistance, as is evidenced by the fact that good renal function persists many years after injury in a large number of patients with and without catheters. The most prevalent bacterium is Proteus vulgaris, which is resistant to most drug therapy. This same urea-splitting bacterium also causes alkaline urine, and it has not been possible to maintain an acid reaction via diet or drugs. In my opinion the use of ammonium chloride to acidify the urine is contraindicated by its osteoporotic effect. During acute pyelonephritic sieges, control of chills and fever can usually be achieved merely by giving large doses of intravenous fluids, as long as no urinary obstruction exists, e.g., by calculi.[2e]

The methods used to create a "catheter-free state" depend on whether the lesion in the spinal cord is above the conus medullaris (upper motor neuron type), at or below the conus medullaris (lower motor neuron type) or a combination (mixed type). The presence of (1) a response to filling the bladder quickly with 2 to 3 ounces of ice water, (2) a rectal (external) sphincter tone, (3) an anal reflex, (4) a bulbocavernosus reflex, (5) a tendon of achilles reflex, or (6) a combination indicate reflex activity through the conus, i.e., an upper motor neuron bladder. Obviously, the absence of all of the aforementioned reflexes indicates a lower motor neuron bladder. The presence of rectal (external) sphincter tone and/or a bulbocavernosus reflex with no response to filling the bladder with ice water is the usual mixed type observed in traumatic cord lesions.[6]

During spinal shock, all bladders are of the lower motor neuron type (state of arreflexia below the level of the lesion);

only by frequent (at least bi-weekly) testing at the bedside of the aforedescribed reflexes can one ascertain when conal shock has subsided. Interestingly, the earliest return of the bulbocavernosus reflex was observed in a patient with a complete cervical lesion four hours after the injury. At the same time, all other reflexes were absent below the level of the injury.

Conservative therapy starts with bladder training. Admittedly, bladder training has no practical value in dealing with lower motor neuron bladders (which includes the period of spinal shock), since there can be no "conditioning of the vesical reflexes" as with upper motor neuron bladders. Yet, for psychologic reasons,[7] bladder training can be started on a bladder of any type once the absence of vesicoureteral reflux has been proved by cystograms after stabilization of the patient. Naturally, this training aids in "conditioning of the reflexes" in upper motor neuron bladders. Furthermore, bladder training has proved its value in preventing contracture, especially in upper motor neuron bladders.[2b] Once the training has been started, it should be continued as long as the patient has a catheter *in situ*, whether temporary or permanent; suprapubic, perineal or intraurethral. Contraindications to bladder training are: (1) vesicoureteral reflux leading to a pyelogram as demonstrated by cystograms and (2) fever, irrespective of cause.

The bladder training employed here consists of instructing the patient to drink one glass of water hourly, beginning at 6 or 7 a.m., until bedtime. The catheter should be clamped for periods that will allow no more than 400 cc. to accumulate in the bladder. This must be determined by repeated testing. For practical purposes, one hour is a safe period for clamping and unclamping the catheter; yet as much as 900 cc. can accumulate in the bladder within an hour, in spite of a specific hourly intake. At bedtime the catheter is placed for straight drainage to the bottle on the floor until morning, when bladder training is resumed.[8]

In addition to bladder training, the various blocking procedures are begun at bi-weekly to tri-weekly periods in patients with upper motor neuron bladders; namely, pontocaine anesthesia of the vesical mucosa, pudendal blocks, selective sacral blocks, ice-water fills and/or combinations.[9] It is obvious that should a "trigger" be hit by one of these procedures and thus create bladder balance, the others are not necessary. When conal activity is absent (lower motor neuron types) the aforementioned measures are of no use, with the possible exception of pontocaine fills, which may affect the sympathetic reflex arc of the smooth sphincters of the vesical neck.[2o]

Conservative therapy consists of the use of drugs. Parasympathomimetic drugs, e.g., urecholine, are used for inactivity of the bladder muscle, but their value is equivocal. Per contra, banthine and hexamethonium are helpful for the correction of hyperactivity of the bladder muscle and the prevention of autonomic hyperreflexia as evidenced by paroxysmal hypertension, etc.[10]

Conservative therapy is continued up to and beyond one year. Weekly tests of residual capacity are performed routinely (as well as one hour and twenty-four hours after each anesthetic block) for possible delayed effects. The tests for residual capacity, as has been mentioned, should ordinarily not be prolonged for more than one hour, in order that overdistention may be prevented.

Once conservative therapy has failed, more radical procedures are considered. These are selected on the basis of the various responses to blocks. Up to the time of writing, in this station, the results with pudendal neurotomies have been good when pudendal blocks produced only tem-

porary balance. The principal contraindication is the possible subsequent loss of erections. Obviously, if no erections occur, the pudendal neurotomy is in order; if erections continue, anterior resection of the vesical neck will usually suffice.[11] Subarachnoid alcohol injection, anterior rhizotomy and extradural sacral neurotomy have not yet been used to create lower motor neuron bladders from a functional point of view.[12] They have been used, however, either to prevent contracture of the bladder or pathologic autonomic responses. Finally, the resection of the vesical neck is performed on any type of bladder if imbalance still persists; at times repeated transurethral resections are necessary.[13] It should be noted that whereas, within four to five days after transurethral resection in a normal person the balance of vesical function is usually satisfactory, function in a traumatic cord bladder resection may not be balanced from two to three weeks after the operation.

Success has been achieved here with external sphincter resections in 5 patients with obstinate symptoms. Gibbon, too, has used this procedure successfully.[3a] It should be noted that sometimes, after a radical operation, vesical balance returns only after conservative measures have been tried again. For example, a patient may not respond to a pudendal block or to subsequent resection of the vesical neck; yet he will respond, after the latter procedure, to a pudendal block with well-balanced function.

Experience indicates that bladders which become functionally balanced under conservative measures promise more future stability than do the "man-made" balanced bladders.

Expressing the ratio of residual urine over capacity as a percentage, 0 to 20 per cent is considered compatible with an upper motor neuron bladder (reflex voiding) whereas 0 to 10 per cent is compatible with a lower motor neuron bladder (voiding by strain or crede). If the aforementioned percentages are demonstrated, Bors calls the function of these bladders "balanced." If residual urine exceeds these percentages somewhat, and yet the patient remains clinically well without a catheter, i.e., without fever and with good excretory urograms, he may be permitted to go on without treatment if closely observed. On the other hand, if with the same amount of residual urine the patient is not well or shows pyelographic deterioration of the kidneys, he is obviously not ready to part with his catheter. A few patients have excellent kidneys and yet become febrile if left without catheters, in spite of the fact that no residual urine is present. In this small group the catheters are permitted to remain.

In a previous publication I stressed the fact that, although every effort should be made to make each patient "catheter-free," the urologist must not be discouraged if he is unable to do so in every instance. Some bladders can not be made "catheter-free" in spite of years of experience and effort on the part of the surgeon. Some require a catheter from the very onset of injury; others require the reintroduction of catheters after a short catheter-free interval, because of such complications as vesicoureteral reflux, penoscrotal pathologic changes, urethroischial diverticula, hydronephrosis, renal calculosis, severe pyelonephritis, stricture of the vesical neck, etc.

The urologist should not fear that renal function will necessarily deteriorate because a patient must retain a catheter permanently. A fair number of patients treated at this center have retained catheters for as long as twelve years, despite the fact that renal function is satisfactory. Intraurethral catheters offer better drainage than do suprapubic catheters and are preferred for permanent use unless chronic

suppurative urethritis, penoscrotal disease or recurrent epididymitis is present.

It is reiterated that every attempt should be made to remove the catheters eventually; yet it must also be stressed that, despite a functionally well-balanced bladder, regressive changes develop in the kidneys. These regressive changes can usually be checked by instituting straight catheter drainage in spite of low to zero values for residual urine. The bladder thus becomes actually a secondary, nonvital problem, while renal function retains prime vital interest. The neurogenic bladder will remain a challange to the urologist, because its functional potentiality cannot be predicted with certainty.

Once "catheter-free," the majority of patients prefer, for obvious social reasons, to wear the "condom type" of receptacle. We have made no dogmatic demands for twenty-four hour voluntary control. A few patients in whom "triggers" for so-called voluntary control have developed do not wear receptacles unless coerced to do so. Few patients indeed, however, will forego this safety device.

Tidal Drainage.—Tidal drainage seems to have become synonymous with the treatment of a neurogenic bladder since the method was popularized by Munro. Originally, all patients at this center were treated with tidal drainage, and consequently no controls were available. Yet, as the years have passed and new patients have arrived without catheters from various hospitals and from regions in which tidal drainage was unknown, histories disclosed that vesical function had, in most instances, returned spontaneously. For an actual study of the effect of tidal drainage, a scout investigation was undertaken at this center while the patients were still being treated with tidal drainage. Of 118 patients, 53 (45 per cent) became spontaneously catheter-free when straight drainage was employed; 34 (29 per cent) when other methods were used (blocks, transurethral resection, etc.), and 31 (26 per cent) as a result of tidal drainage and/or bladder training. It was also observed that the "other method group," which had been treated by tidal drainage and bladder training, had failed to achieve balance as a result of these measures. It was "concluded that tidal drainage and/or bladder training is not a panacea."[2b]

With this as an impetus, tidal drainage was more or less discontinued in this service, and the 82 patients most recently discharged were interviewed and their bladder status noted. It should be stressed that bladder training, although not considered a panacea either, was continued as regularly as possible because of (1) the possibility of rehabilitating the viscus, (2) the prevention of possible contracture of the bladder and (3) the avoidance of psychic disturbance.

Seven patients were discharged with catheters either because of early discharge (administrative or hardship problems) or because they preferred their catheters. Seventy-five patients were discharged catheter-free. Fifty-five (73 per cent) became catheter-free spontaneously; 12 (16 per cent) became catheter-free with the aid of mucosal or various nerve anesthesias; 8 (11 per cent) became catheter-free after resection of the vesical neck.

On the basis of the original scout study of 118 patients and the cases of the 75 additional patients of the present series, I am convinced that the expenditure, maintenance, regulation of syphon levels and time involved in training personnel and patients in its use does not warrant the routine ordering of tidal drainage as a "must" for the creation of a catheter-free bladder.

RÉSUMÉ

Le retour a la fonction physiologique de la vessie a été étudié chez 579 patients

laminectomisés et 279 non laminectomisés, atteints de lésions de la moëlle épinière; la récupération du contrôle vésical a été constatée dans 5% des cas de la première série et 10% de la seconde série. La nécessité d'un traitement urologique est évidente dans la plupart des cas de lésions de la moëlle, et l'auteur décrit le cours systématique de la méthode appliquée au Veterans Administration Hospital de Long Beach, comprenant également un "training" de la vessie. Il fait ressortir que le drainage selon Munro, largement appliqué depuis sa diffusion par cet auteur, n'est nullement infaillible et ne justifie pas les frais et le travail que sa routine exige. Une étude a été faite sur cette forme de traitement chez 118 malades. Dans 35 cas (45%) le catheter a pu être supprimé par drainage direct, dans 34 cas (29%) par blocage anesthésique ou résection de transuréthrale du col vésical, et dans 21 cas (26%) par la méthode de Munro avec ou sans training vésical.

RIASSUNTO

Venne studiato il ritorno alla fuzione normale della vescica in 579 soggetti operati di laminectomia e in altri 279 con traumi del midollo spinale; nel 5% del primo gruppo e nel 10% del secondo vi fu la ripresa del controllo della minzione. L'assistenza urologica è ovviamente necessaria nella maggioranza dei pazienti con lesioni midollari; l'autore ne traccia i principi seguiti al Veterans Admin. Hosp. di Long Beach, compreso un metodo di "rieducazione vescicale." Egli ritiene che il drenaggio periodico, largamente impiegato da quando Munro ne sostenne l'utilità, non è affatto infallibile e non giustifica il costo e la fatica che richiede. E' stata fatta una ricerca a questo proposito ed è risultato che di 118 pazienti trattati con questo metodo il 45% si liberò del catetere dopo drenaggio semplice, il 29% dopo blocco anestetico o resezione transuretrale del collo, it 26% dopo drenaggio periodico o rieducazione vescicale.

RESUMEN

Se ha hecho un estudio del retorno de la función vesical en accidentados de médula, 579 laminectomizados y 279 no, con recuperación del control de la vejiga en el 5% de los primeros y 10% de los segundos. Los cuidados urológicos son de la mayor importancia en el caso de pacientes con lesiones medulares y por ello el autor describe todo un método de tratamiento para estos traumatizados en el Veterans Administration Hospital de Long Beach, incluyendo un método de "entrenamiento vesical." El autor señala que el método de drenaje periódico popularizado por Munro no es ciertamente infalible y no justifica las molestias que origina su empleo. Se hace un estudio de 118 tratados con este método. 53 enfermos (45%) lograron librarse del cateter; 34 (29%), consiguieron con los bloqueos anestésicos o por la resección transureteral del cuello de la vejiga, y 21 (26%), como resultado del drenaje periódico con o sin entrenamiento de la vejiga.

SUMARIO

Estudo o retorno do equilibrio funcional de bexiga em 579 laminectomisados e 279 não operados com lesões da medula, apresentando 5% de recuperação da função vesical nos pacientes cirurgicos e 10% nos que foram tratados clinicamente. O A. descreve uma norma de treinamento dos doentes incluindo um método usado no V.A.H. denominado "treinamento vesical." Critica o emprego universal da drenagem continua que não justifica sob os aspectos economicos e os cuidados que exige. Fez um estudo a respeito em 118 doentes. Cin-

coenta e tres (45%) tornou-se livre do cateter por drenagem direta; 34 (29%) com bloqueios anestesicos ou resecção transuretral do colo vesical e 21 (26%) com dateterismo permanente ou treinamento vesical.

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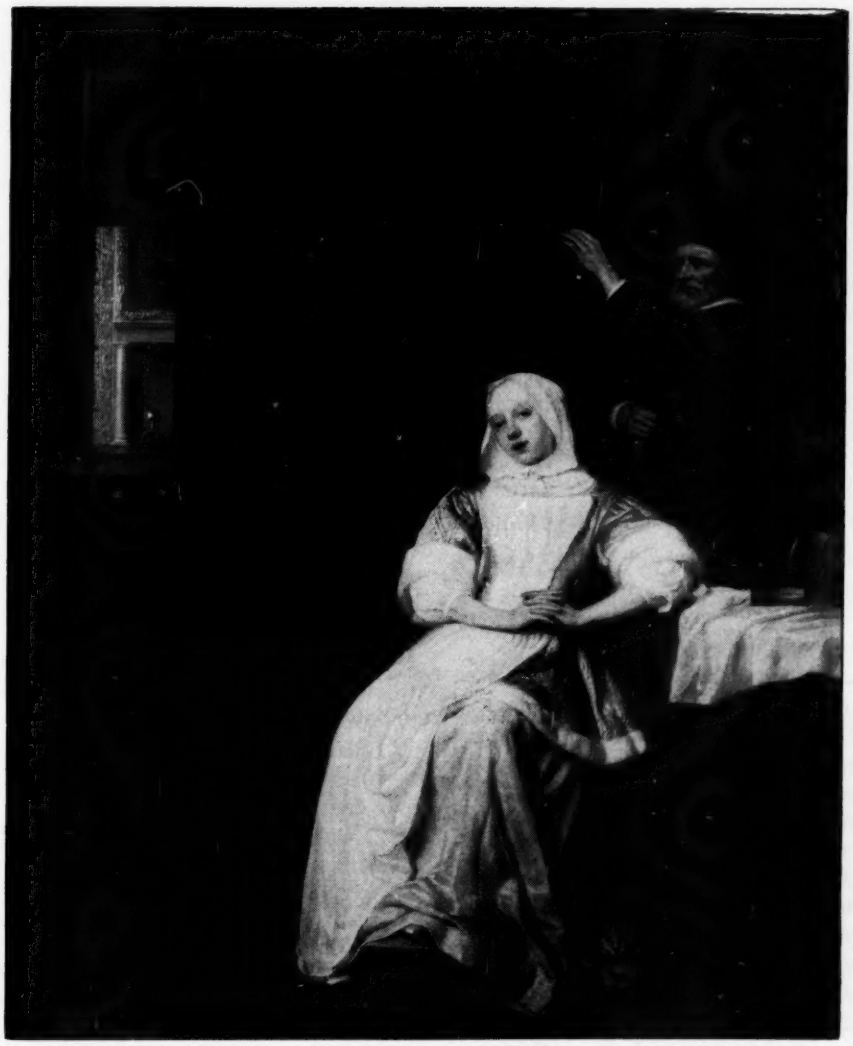

"The Sick Lady," by Samuel van Hoogstraten, a disciple of Rembrandt. Not many of his paintings are left. The dark though vigorous style of painting he acquired from Rembrandt did not please the majority of his sitters, so he adopted one which is more clear and agreeable. "The Sick Lady" reveals his capacity as a portrait painter, as well as the vivid coloring, which contrasts the healthy hue of the physician's face with the profound anemia of his patient. *(Reproduced by courtesy of the Rijksmuseum, Amsterdam, The Netherlands.)*

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Obstetric and Gynecologic Surgery

Sterility in Women

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IT is estimated by many authorities that about 40 per cent of cases of infertility involve the husband's inadequacy.[1]

For ruling out inadequacies observed in either a man or a woman, Wassermann tests should be made, with a complete blood count, a urinalysis, a basal metabolism, tubal insufflation (Rubin test), endometrial biopsy, a postcoital test to determine whether cervical secretions are hostile or receptive to the spermatozoa, and a record of basal body temperature should be included and a hysterosalpingographic examination as well if the Rubin test indicates occluded tubes.

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The authors present a review of current knowledge and opinion with regard to involuntary sterility in either sex, with an extensive study of the causes thereof. The work of many contemporary investigators is cited. It is estimated that 10 per cent of marriages are infertile, with varying degrees of fertility in the remaining 90 per cent. Diagnostic studies and tests are listed, as are various therapeutic measures. In the authors' opinion, neither the diagnosis of sterility nor the extensive investigation it demands is justifiable until at least one year of intelligent marital effort has proved futile.

Aside from structural and general health factors, female infertility can usually be attributed to one or more of the following causes:

1. Hostility of cervical secretions. This was observed by one author in 30 to 37 per cent of cases of infertility.

2. Tubal blockage due to tortuosity, spasms or mucus plugs.

3. Absence of ovulation because of endocrinopathy, observed in approximately 10 per cent of cases.

Estrogen administration may act in two ways:

1. It may increase the glycogen content of the cervical secretions, allowing the sperm a source of energy for reaching the ovum.

2. It may change the p_H of the cervical secretions, making them more favorable to reception of sperm.

Infertility may be due to infected cer-

vical secretions hostile to spermatozoa. Repeated tubal insufflation may be very valuable in overcoming uterine occlusions or obstructions possibly caused by a tubal spasm.

A study made by C. J. Collins, *Low Dosage Pituitary-Ovarian Irradiation in Secondary Amenorrhea and Associated Sterility,* was highly interesting.[2] Many authors, including Rubin, Kaplan, Dripps, Haman and others, disapprove of this therapy because of the fear of ovarian damage or injury to future offspring. With regard to this hazard, it is generally known that many gynecologists have disapproved of this method on the hypothetical basis that damage may be done to the genes of the future pregnancies.

The ages of the patients, the duration of amenorrhea and the results of treatment are presented by the author, who is convinced that the cyclic administration of steroid therapy is beneficial in some cases.

After careful clinical evaluation, a systematic study should be carried out as indicated in each individual case, to ascertain the following factors:

1. Male infertility
2. Endocrine deficiencies
3. Cervical insemination
4. Tubal patency

Some of the predominant causes of sterility are, according to Johnson: (1) Tubal factors, 32.6 per cent; (2) Endocrine factors, 20.9 per cent; (3) Male infertility, 15.1 per cent; (4) Combined factors, 12.8 per cent; (5) Other causes (cystic ovaries, bicornuate uterus, etc.), 5.8 per cent, and (6) undetermined factors, 12.8 per cent.

Rita S. Finkler stated that involuntary sterility occurred in her series in about 17 per cent of all marriages.[4] In the male its incidence is about 40 per cent, in the female about 50 per cent and in both partners about 10 per cent.

Certain specific tests are necessary for diagnosis of sterility:

(a) endometrial biopsies;
(b) vaginal smears;
(c) basal temperature graphs, and
(d) estimation of the urinary gonadotropins.

Vaginal smears and basal temperature graphs usually, though not always, parallel these abnormal endometrial observations.

The estimation of urinary gonadotropin is valuable, since an elevated gonadotropic titer indicates primary ovarian deficiency with compensatory pituitary overactivity.

Endocrine therapy consists chiefly of administration of anterior pituitary hormone or gonadotropins. Gonadotropins administered in the second half of the cycle are combined with the anterior pituitary hormone of the first half of the cycle.

Beilly's and Greenberg's studies of 319 cases[5] reveal the following incidences:

(a) Anovulatory endometrium, 21 cases, or 4.7 per cent, 1 pregnancy; (b) Hypoplastic genitalia, 40 cases, 4 pregnancies, or 10 per cent; (c) Hypothyroidism, 54 cases, 8 pregnancies, or 14.7 per cent; (d) Menstrual irregularity, 68 cases, 6 pregnancies, or 8.8 per cent, and (e) Obesity, 81 cases, 7 pregnancies, or 8.6 per cent.

Of 79 patients whose cases were completely studied, these authors noted that 36 men were totally, or to a large degree, responsible for sterility.

Hydriodic acid to overcome tubal occlusion in sterility has been used with questionably good results in a few cases.[6] "Iodide should not be used in any case suspected of tuberculosis because of the danger of its increasing the activity of the disease."

All physicians and surgeons have encountered the occasional case of sterility in which the patient comes for consulta-

tion after some years of sterility. When very little is done the patient becomes pregnant later, which is probably due to emotional factors. In recent years we have learned that there is a close connection between the hypothalamus and pituitary gland and the rest of the endocrine system.[7] Cleghorn pointed out that there is no longer room for the dichotomy between the psychologic and the physiologic.

Corner has shown that in animals many eggs are fertilized only to be lethally changed by secretions *en route* to the uterus and, as a result, may not be implanted.

It is estimated that, in general, about 10 per cent of all married couples are sterile. Among the remaining 90 per cent there are varying degrees of fertility.[8] Some of the faults in reception that might be mentioned are:

1. Functional disability—dyspareunia
2. Mechanical barrier — malformation and deformities
3. Inflammatory states of the vulva or vagina
4. Intercourse without direct cervical insemination
   a. Disproportion
   b. Anteflexion or anteversion of cervix
   c. Elongation of cervix
      1. Developmental
      2. Hypertrophic
   d. Prolapse of the uterus

The cause of hostility of the cervical secretions may be only (1) chemical, (2) bacterial, (3) serologic or (4) mechanical.

Possible causes of uterine blockage are (1) pregnancy, (2) congenital absence of the uterus, (3) complete atresia, (4) surgical removal, (5) obliteration of the uterine cavity or the tubal lumen by tumor, or (6) acute anteflexion and retrodisplacement.

Patients with tubal obstruction and occlusion may have been affected by

1. Developmental malformation
2. Inflammatory damage
   a. Gonorrhea
   b. Postpartum or post-abortal
   c. Tuberculosis
   d. Generalized extrapelvic peritonitis
3. Spasm
4. Other causes
   a. Transient cohesion of the endosalpingeal surfaces
   b. Mucus plugs in tubal lumen
   c. Pressure from extrinsic tumors
   d. Surgical operations
   e. Pelvic endometriosis

As results of abdominopelvic examination we have observed (1) malformations and deformities interfering with normal coitus; (2) external vestiges of old gonorrhea with chronic infection of Skene's or Bartholin's glands; (3) urethral, vulvar or anal lesions productive of dyspareunia; (4) positions of the cervix interfering with normal insemination; (5) stenosis of the external os; (6) chronic endocervicitis; (7) evident stigmata of hypoplasia, a long cervix, a small uterus; (8) fixed retrodisplacement of the uterus, and (9) palpable pathologic conditions of the adnexae.

Local mechanical factors have a high incidence in cases of infertility. They constitute approximately 45 per cent of all demonstrated factors and are present to some degree in 96 per cent of cases, according to Meaker.

Some of the local factors observed in 50 cases of sterility studied by one author were:

	Cases
Hypoplasia	18
Bicornuate uterus	2
Cystic degeneration of ovaries with malposition	6
Adnexal adhesions	5
Tubal obstructions	13
Fibromyomas of the uterus	2
Retrodisplacement of the uterus	3
Abnormal endocervical secretions	4
Endocervicitis	8
Vaginismus (dyspareunia)	2

There are two basic reasons for fear behind the reluctance of men objecting to irradiation: (1) Fear of damage to the ovaries and lack of knowledge of the physiologic aspects of such therapy and (2) fear of genetic damage to present or future generations.[9]

Harris, on the other hand, has stated that life is a calculated risk throughout and this is merely another calculation. One chooses only a small percentage of the population for this treatment, and the possibility of measurable damage is most remote.

In considering the rationale for roentgen therapy, one can philosophically justify what may be a genetically perilous pursuit; and if one is willing to employ empirically a weapon of known value despite a lack of physiologic backing, then roentgen treatment of the ovaries and pituitary belongs in the therapeutic armamentarium of the gynecologist.

There are several contraindications to roentgen therapy that can be noted at this time: (1) Previous unilateral oophorectomy with one bad result; (2) the upper age limit of 35 years, with special care required after 30; (3) immature ovaries in patients not under the age of 20, and (4) the remote possibility of pregnancy.

1. Ingalls and his co-workers concluded that, in carefully selected patients on whom a thorough sterility workup has been done and an anovulatory endometrium observed, roentgen therapy to the pituitary and ovaries is a most effective contributor to the production of an ovulatory endometrium.

2. Violation of the basic contraindications to its irradiation may yield bad results.

3. When pregnancy occurs after roentgen therapy, the number of faulty conceptions does not appear to be higher than in a routine series of pregnancies.

Present-day clinical medicine has made tremendous strides in improving the public health, but up to time of writing the problem of psychogenic sterility and fertility has received scant attention.[10]

Matthews and Mackie,[11] in their study of 107 pregnancies in a sterility clinic, classified the cases into three groups:

1. *Primary Sterility.* — In this group there were 70 pregnancies. The average age of the patients was 29 years, the youngest being 21 and the oldest 41.

Etiologic Factors, General: These are

Malnutrition and obesity
Infrequency of intercourse
Previous appendicitis

Etiologic Factors, Local: Local causes include

Polycystic ovaries
Intact hymen
Hypoplasia
Retroverted uterus
Trichomonas vaginitis

Etiologic Factors, Cervical: The uterine cervix may be involved in

Chronic infection
Deficient secretion
Hypoplasia
Displacement by retroversion
Tight internal os

Etiologic Factors, Endometrial: Abnormalities of the endometrium may produce

Recurrent amenorrhea
Recurrent amenorrhea with occasional anovular cycles
Irregular menstruation with occasional anovular cycles
Regular menstruation with occasional anovular cycles

Tubal: Causes connected with the fallopian tubes are

Inactive patency
Obstruction
Spasm

In cases of secondary sterility in this group there were 29 pregnancies.

Mengert stated that healthy, young and apparently normal married couples gen-

erally expect to have offspring soon after they bend their energies to that purpose. Eighty to 90 per cent of the wives conceive within twelve months of the first adequate opportunity.[12]

In childhood the uterine corpus is much shorter than the cervix, the ratio being 1:2. Later, when maturity develops, the body of the uterus grows much faster than does the cervix; the measurements change, and finally the ratio in the adult female becomes 2:1.[13]

If surgical intervention is decided upon, often the highest possible degree of technical skill is essential to success.[14] All members of the profession are called upon from time to time to give an opinion about the merits or demerits of operative intervention, and it is very often as important to know when not to operate as when to operate.

The main problems under late marriage, voluntary and involuntary sterility and spinsterhood are all implicated. In this group, of course, the polycystic ovary plays one of the leading roles. This may be associated with anovular menstrual cycles; if so, it will inevitably be a cause of infertility.

Rydberg and Madsen published an article discussing patients of two types:

1. Those who have amenorrhea or functional bleeding as signs of ovarian dysfunction, in whose cases conception rapidly followed treatment with gonadotropic hormones.

2. Those who are functionally sterile with a normal menstrual history.

Patients of the first type seek treatment for ovarian dysfunction, manifest as disturbances of the menstrual cycle, abnormal bleeding and amenorrhea.[15]

Patients of the second type are chiefly concerned with sterility and do not suffer from any menstrual disturbances.

Unless the husband is willing to cooperate to the utmost, it is difficult to treat the woman and accomplish any good results.[16]

Some of the therapeutic measures indicated are outlined as follows:

1. The patient should avoid alcohol, tobacco, caffeine and sexual excesses.
2. Regular hours of sleep, exercise and work are important.
3. An adequate intake of proteins and vitamins should be maintained.
4. Adequate thyroid medication (under supervision) is advisable.
5. Adequate vacations from business and social responsibility are helpful.
6. The local thermal environment should be adjusted.
7. Occasionally, gonadotropin or testosterone therapy should be employed.
8. Surgical testicular biopsy, epididymovasostomy, or irrigation of ductus deferens, as well as catheterization of the ejaculatory ducts, should be tried.

The minimal routine diagnostic procedures for the wife are as follows:

1. History and physical examination.
2. General laboratory examinations; blood tests, Wassermann test, complete blood count, including sedimentation rate and if there is a high white blood count, and urinalysis.
3. Tests of basal metabolism.
4. Tubal insufflation.
5. Endometrial biopsy.
6. Miscellaneous diagnostic tests—intracervical postcoital examination, incompatibility test with cervical smear, gram stain, vaginal hanging drop and stained smear.
7. Ovulation timing (endometrial biopsy, basal body temperature).

Studdiford, in his conclusions, stated that pelvic tuberculosis in women almost always causes sterility and may be the only symptom of its presence in the subclinical stage of the infection.[17] In many

patients with pelvic tuberculosis the disease is subclinical and the oviducts are patent.

Cervical polyps are not infrequently encountered and require excision. Fibroids may indicate myomectomy owing to their size or position. It is surprising, however, how infrequently fibroids play a role in infertility.[18]

The tubal factor remains the largest contributor to sterility in the female. Its incidence varies in different studies from 40 to 50 per cent.

With regard to some of the newer surgical technics for operation on the fallopian tubes, it is interesting to note the work done by Weisman[19] and Castallo and others, in which, even though the polyethylene tubing is properly handled, sutured and guarded, accidents may occur. Polyethylene tubing has been known to become lost in the peritoneal cavity.

It is still too early to evaluate the results of the polyethylene technic. Rock and his group in Boston reported 38 per cent patency in 63 tubal operations in which polyethylene tubing was used as an obturator.

Among general practitioners there is a tendency to consider the treatment of a childless couple as outside the family doctor's scope and to refer these couples at once to someone else for advice, quite regardless of whether the consultant whose advice is sought has a specific interest in this subject.[20]

Some of the main points for the study of cases are:

1. Post-coital tests
2. Calculation of the time of ovulation by temperature charts
3. Hysterosalpingographic studies
4. Seminology

A consultant may be of benefit to the general practitioner in giving such advice, information and aid as:

1. A detailed opinion of the pelvis, if necessary with the patient under anesthesia, including an endometrial biopsy with the possible revelation of hypoplasia, anovulation and, particularly, tuberculosis.

2. Investigation of the cervix in cooperation with the pathologist, with determination of the p_H, cellular and bacterial content of the cervical plug, and degree of stickiness of the cervical mucus; cauterization for endocervicitis and erosion.

3. Investigation of tubal patency—insufflation and/or salpingography. Rubin stated that 36 per cent of his private patients became pregnant within three months of one or two insufflations of carbon dioxide.

4. Operative procedures — hymenectomy; uterine suspension; myomectomy; plastic procedures for rare congenital abnormalities of the uterus; salpingostomy; tubal implantation, and operations on the cervix.

5. Artificial insemination.

Anovulation.—There may or may not be evidence of hypoplasia in cases of anovulation, but frequently there is dysmenorrhea or amenorrhea.

Sharman, in Glascow in 1943, discussing tuberculosis of the endometrium, showed that in 5.1 per cent of his cases of subfertility there was unsuspected tuberculosis, but he has lowered this incidence considerably in the past few years. Endometrial tuberculosis is ten to fifteen times as common in sterile women as in those who are fertile. In 83 per cent of Sharman's cases of tuberculous endometritis, tubal blockage was observed.

Tubal Factor. — Both tubes were occluded in 15 per cent of the cases, and the tubes were patent in 60 per cent of 1,190 cases of primary sterility investigated by Green-Armytage.

Salpingostomy and Tubal Implantation: Even in expert hands, if the lesion is bi-

lateral the chance of success is about 18 per cent, according to Bonney.

Artificial Insemination.—Sanctuary has stated: "I have decided many years ago on the advice of Aleck Bourne to have nothing to do with this, as I cannot see morally how the sperm can be obtained without breaking at least one of the commandments."

In the use of the husband's own sperm, Davidson, or one of his colleagues, in treatment of the genitourinary tract, has decided that, even when this is necessary, the incidence of success is only 10 per cent.

Sperm Studies and Tubal Patency Tests.—These should always be repeated. The following questions are usually asked:[21]

1. Is the sperm normal?
2. Is the sperm reaching the uterus?
3. Are ova being produced?
4. Are the ova reaching the uterus?

Williams estimated the incidence of male responsibility at 50 per cent.

A complete analysis of the semen includes volume, count in numbers per cubic centimeter, motility and morphologic character. The standard minimum values, according to Simmons, are as follows:

Volume: 2 to 4.5 cc.

Motility: 70 to 80 per cent (with a time limit of six hours at 60 to 70 F.)

Count: 60,000,000 per cubic centimeter

Morphologic type: 70 per cent of the sperm population normal

The presence of 50 or more spermatozoa per high power field in the mucus is considered satisfactory, although Rock stated that 10 per high power field is enough to insure fertilization.

Radiopaque mediums offer several advantages over carbon dioxide. Among them are the following points:

1. The obstruction can be localized
2. Unilateral occlusion can be seen
3. Filling defects of the uterine cavity are outlined
4. The diagnosis of tubal disease can often be confirmed
5. Positional defects of the uterus can be confirmed

As has been stated, at least 10 per cent of all marriages are involuntarily childless. Investigation of marital sterility demands, in the main, three approaches:[22]

1. A thorough history and physical examination of both husband and wife to exclude poor health in either
2. An appraisal of the male reproductive system, including examination of the semen
3. An investigation of the female reproductive system

The arbitrary minimal standards for evaluation of semen, as set by the Society for the Study of Sterility, are as follows:

1. Liquefaction: Within ten to thirty minutes
2. Volume: 2.5 to 5.0 cc.
3. Motility: 60 to 70 per cent within two hours
4. Sperm count: A minimum of 40,000,000 spermatozoa per cubic centimeter, with a total of at least 125,000,000 per ejaculation.
5. Morphologic type: 80 per cent normal

Faulty spermatogenesis is a common and major problem.

The value of testosterone, as well as that of various forms of gonadotrophic therapy, is still conjectural and is viewed with pessimism by most. Although it may stimulate sex drive and even hypoandrogenism, it may also damage seminal function.

The third group of causative factors in sterility—those of the female pelvis—will be listed on an anatomic basis.

1. *Vaginal Factors*
   Obstructions of the vaginal canal

Dyspareunia
Vaginitis

2. *Cervical Factors*
   Inflammation, abnormal secretion and inaccessibility
   Cervicitis and endocervicitis
   Abnormal secretion
   Inaccessibility of the cervix to spermatozoa
3. *Factors Related to the Uterine Fundus*
   Endometrial dysfunction
   Inflammation
   Congenital or acquired abnormalities
4. *Endometrial Dysfunction*
   Principally, anovulation and improper estrogen-progesterone action. The test for endometrial dysfunction is biopsy or curettage.
5. *Abnormalities of the Fundus*
6. *Tubal Factors*
   Adhesions with or without inflammation
   Fimbrial incompetence
   Obstruction
   Dysfunction
7. *Ovular Factors*
   Anovulation
   Luteal inadequacy
   Defective ova

The various methods employed by different clinicians are beyond the scope of this presentation.

Neither the diagnosis of sterility nor the extensive investigation it demands is justified until at least one year of intelligent marital endeavor has proved futile.

Properly treated patients have approximately a 30 per cent chance of pregnancy. Many contributing factors—errors in insemination, mild spermatic and ovarian deficiencies of a mild nature, hypothyroidism, and certain infections in both male and female—are correctable.

Ovulation may be detected in one of several ways. The three common tests at present[23] are as follows:

1. Basal body temperature curve. The patient takes the temperature before arising every morning and plots it on a chart.
2. The endometrial biopsy. A sample of the endometrium is taken on the first day of menstruation.
3. Vaginal smears. Taken daily, these enable one to determine whether ovulation occurs or not.

McLeod stated: "We can find no elevation in fertility potential of the male much above a level of 20,000,000 per cubic centimeter."

The presence of amenorrhea permits the assumption that an endocrine derangement requiring treatment exists in the wife.[24]

Differential Diagnosis of Amenorrhea.—The causes of primary and secondary amenorrhea, as well as of oligomenorrhea, though undoubtedly similar, are not past dispute.

The major problem to be solved when one is confronted with an example of primary amenorrhea is to determine whether or not its origin is one of uterine development.

It has been stated by Wilson that a reasonable explanation of absolute or relative infertility can be found in about 60 per cent of patients who are primarily infertile.[25] The causes are about equally divided between the two sexes. A complete study of infertility, therefore, should include examination of both husband and wife.

In the past the burden of barrenness was usually cast upon the wife, and by many races was, and still is, considered a ground for divorce. Statistics show that approximately 17 per cent of marriages in the United States fail to produce offspring, and 5 to 8 per cent result involuntarily in only one child.[26]

Basically, then, the fundamental factors involved in this entire process are as

follows: (1) delivery of normal spermatozoa; (2) reception of spermatozoa; (3) delivery of a normal ovum, and (4) establishment of a favorable site for implantation of the fertilized zygote.

In obtaining a specimen from the husband, the following principles should be adhered to:

1. The husband should abstain from ejaculation for three to five days before collecting the specimen.
2. The specimen can be collected either by coitus interruptus or by masturbation.
3. A clean, dry, widemouthed jar should be used to contain the specimen (condom specimens not acceptable).
4. The specimen should be transported to the office within two hours after passage.

If the ejaculations are spaced three to five days apart, the semen will contain the maximum number and highest quality of sperm possessed by the person under observation.

Tubal studies may be made in the female, by using gases such as oxygen or carbon dioxide as in the Rubin test, or instilling some of the radiopaque medium into the uterus and tubes and taking serial roentgenograms. Usually one film is taken after slowly injecting up to 5 cc. of contrast medium. If peritoneal spill is observed at this time, no further films are necessary, but if spill does not occur, a twenty-four hour film is indicated.

CONCLUSIONS

It is estimated that in cases of sterility the male is the sterile partner in 40 per cent.

Specific diagnostic tests are as follows: (a) endometrial biopsy; (b) vaginal smears; (c) basal temperature graphs, and (d) estimation of the urinary gonadotropins.

An estimated 10 per cent of all married couples are sterile. In the remaining 90 per cent there are varying degrees of fertility.

Radioactive treatment of the ovaries or the pituitary gland is still debatable by many, owing to fear of possible injury to genes or future offspring.

In studies of female sterility, ovarian, tubal, endometrial, cervical and vaginal factors should be carefully ruled out. Alcohol, tobacco, caffeine and sexual excesses are undesirable; proper sleep, exercise, work, protein, vitamins, and thyroid intake are important.

Postcoital tests, ovulation determination, observation of temperature, Rubin tests, and hysterosalpingographic and seminology studies are useful. Standard minimum values with regard to the semen are as follows:

Volume: 2 to 4 cc.

Motility: 70 to 80 per cent

Count: 60,000,000 spermatozoa per cubic centimeter

Morphologic type: 70 to 80 per cent of the sperm population

Polyethylene tubing is valuable in plastic operations on the normal tubes. The cooperation of husband and wife is of great importance.

CONCLUSIONS

La cause de la stérilité est à rechercher chez l'homme dans environ 40% des cas.

Les tests de diagnostic spécifique de la stérilité sont les suivants: a) biopsie de l'endomètre; b) frottis vaginaux; c) courbes de température; d) examen des gonadotropines urinaires.

Environ 10% des couples mariés sont stériles. Le 90% restant comprend des degrés variables de fertilité.

La valeur du traitement radioactif des ovaires et de l'hypophyse est contestée par de nombreux auteurs par crainte d'une lésion possible des gènes ou du foetus.

L'étude de la stérilité féminine demande

une élimination précise des facteurs ovariens, tubaires, de l'endomètre, du col et du vagin. L'alcool, le tabac, la caféine et les excès sexuels sont à éliminer. Les factuers suivants sont par contre vivement recommandables: un bon sommeil, de l'exercice, le travail, ainsi que l'administration de protéines, de vitamines et d'extraits thyroïdiens.

Les tests post-coïtaux, la détermination de l'ovulation, les courbes de température, les tests de Rubin et les examens hystérosalpingographiques et séminologiques sont utiles. Voici les valeurs standard minimum:

Sperme:

Quantité: 2-4 cc

Motilité: 70-80%

Nombre: 60.000.000 par cc

Morphologie: 70 à 80% des spermes.

Le polyéthylène est précieux dans les opérations de plastique des trompes.

La collaboration du mari et de la femme revêt une grande importance.

RIASSUNTO

E' stato stabilito che nei casi di sterilità questa deve essere incolpata al maschio nel 40% dei casi. I metodi per stabilire la sterilita sono i seguenti: biopsia dell'endometrio, strisci vaginali, temperatura basale, dosaggio delle gonadotropine urinarie.

Circa il 10% delle coppie sono sterili; nel restante 90% vi sono vari gradi di fertilità.

Il trattamento radioattivo delle ovaie è molto discutibile per il timore di recare danni ai geni del futuro prodotto.

Nello studio della sterilità femminile si devono prendere in considerazione le ovaie, le tube, l'endometrio, e tutti i fattori vaginali e cervicali. Si devono sconsigliare l'alcool, il tabacco, la caffeina e gli eccessi sessuali; hanno invece importanza il sonno, il lavoro, le proteine, le vitamine e gli estratti tiroidei.

Sono utili anche le prove post-coito, la determinazione del tempo di ovulazione, lo studio della temperatura, il test di Rubin, l'isterosalpingografia.

Il seme deve avere le seguenti caratteristiche: Volume 2-4 cc; Motilità 70-80%; Conteggio 60.000.000 per cc; Morfologia 70-80% della popolazione spermatica.

Negli interventi sulle tube sono utili i trapianti con condotti di politene. E' della massima importanza la collaborazione stretta tanto della moglie quanto del marito.

SCHLUSSFOLGERUNGEN

Es wird geschätzt, dass bei Unfruchtbarkeit in 40 Prozent der Fälle der Mann verantwortlich ist.

Zu den spezifischen diagnostischen Untersuchungsmethoden bei Unfruchtbarkeit gehören die folgenden:

a) Probeexzision der Gebärmutterschleimhaut,
b) Abstriche aus der Scheide,
c) Basaltemperaturkurven und
d) Abschätzung der Ausscheidung gonadotropischen Hormons im Urin.

Schätzungsweise 10 Prozent aller Ehepaare sind unfruchtbar. Die übrigen 90 Prozent zeigen verschiedene Grade der Fruchtbarkeit.

Die Zweckmässigkeit radioaktiver Behandlung der Eierstöcke oder der Hypophyse wird von vielen aus Furcht vor möglicher Schädigung der Erbanlage oder des Nachwuchses in Frage gestellt.

Bei Untersuchungen weiblicher Unfruchtbarkeit sollten ursächliche Faktoren, die die Eierstöcke, die Eileiter, die Gebärmutterschleimhaut, den Gebärmutterhals und die Scheide betreffen, sorgfältig ausgeschlossen werden. Ausschweifungen im Genuss von Alkohol, Tabak und Kaffee und auf sexuellem Gebiet sind unerwünscht; guter Schlaf, körperliche Bewegung, Arbeit, Zufuhr an Eiweiss, Vitaminen und Schilddrüsenhormon sind wichtig.

Von Nutzen sind ferner Untersuchungen nach dem Koitus, Bestimmung der Ovulation, Beobachtung der Temperatur, Prüfung der Durchgängigkeit der Eileiter (Rubin), hysterosalpingographische und Samenuntersuchungen. Die minimalen Normalwerte bei der Untersuchung des Samens sind:

Menge: 2 bis 4 ccm,

Beweglichkeit: 70 bis 80 Prozent,

Zahl: 60.000.000 per ccm,

Morphologie: 70 bis 80 Prozent der Samenbevölkerung.

Bei plastischen Operationen an den Eierstöcken ist die Verwendung von Röhren aus Kunststoff von Wert. Die verständnisvolle Anpassungsfähigkeit der Ehepartner ist von grosser Wichtigkeit.

CONCLUSOES

Estima-se que, em casos de esterelidade, o macho contribue com 40% das veses. Os diagnosticos especificos são os seguintes: a) biopsia do endometrio; b) citologia vaginal; c) graficos de temperatura basal e d) medida das gonadotropinas urinarias.

Calcula-se que 10% dos casais são estereis. Nos 90% remanecentes ha varios graus de fertilidade.

O tratamento radioativo dos ovarios ou da glandula hipofise é discutido pelo receio de muitos de existir uma lesao possivel dos gens ou dos produtos de conceção.

No estudo da esterelidade feminina os fatores ovariano, tubario, endometrial, cervical e vaginal é cuidadosamente feito. O alcool, o fumo, a cafeina e os excessos sexuais são inconvenientes; o sono adequado, os exercicios, esportes, trabalho, proteina, vitaminas e extratos tiroidianos são importantes. Os testes feitos após o coito, a determinação da ovulação, a observação da temperatura, os testes de Rubin, e os estudos histerosalpingograficos e semiologicos são uteis. Os valores padroes minimos são os seguintes:

Semen:

Volume: 2-4 cc.

Motilidade: 70-80%

Contagem: 60.000.000 por cc.

Morfologia: 70-80% da população espermatica.

O uso de tubos de politileno e valioso na pratica das plastica tubarias. A coopareção dos conjuges é muito importante.

CONCLUSIONES

Puede considerarse que con un 40% de los casos de esterilidad el defecto es de parte masculina.

Las pruebas diagnósticas específicas son las siguientes: a) biopsia del endometrio; b) exudado vaginal; c) gráficas de temperatura basal, y d) determinación de las gonadotropinas urinarias.

Puede estimarse que un 10% de los matrimonios son estériles. En el otro 90% hay diferentes grados de fertilidad.

El tratamiento radioactivo de los ovarios o de la pituitaria es discutible por la posibilidad de lesión de los genes con repercusión sobre la descendencia.

Al estudiar la esterilidad femenina debe prestarse cuidadosa atención a los factores referentes a ovarios, trompas, endometrio, cuello y vagina. El tabaco, el alcohol, la cafeína y los evcesos sexuales son factores indeseables, pero en cambio son muy favorables dormir bien, ejercicio, trabajo y suficiente toma de proteínas vitaminas y tiroides.

Son útiles los tests post coitum, determinación de la ovulación, observación de la temperatura, prueba de Rubín y los estudios histerosalpingográficos y seminológicos.

Los valores standard sínimos son:

Semen:

Volumen: 2-4 cc.

Hovilidad: 70-80%

Recuento: 60.000.000 por cc.

Morfología: 70-80% de población espermatica.

En las operaciones plásticas de las trompas útil la intubación con polietileno. La cooperación de marido y mujer son de la mayor importancia.

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However slow the English may have been to appreciate Lister, they made up for it during the later years of his life, and honours were showered upon him lavishly. He was created first Sir Joseph Lister, then Baron Lister; and when death claimed him in his eighty-fifth year, a grateful nation held his funeral in Westminster Abbey, and would have interred him there but for his express wish to be buried at Hampstead beside his wife.

—*Major*

Ophthalmologic Surgery

Hyphema Headaches

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"THE case is liable to be a considerable headache to whomever is taking care of him." In this way ended a consultant's report on a case of secondary hemorrhage due to trauma on the globe. This fits closely the opinion expressed by Thygeson and Beard,[1] who stated: "We are in full agreement with the opinions of Rychner and Laughlin that, when secondary hemorrhage occurs, the prognosis shifts immediately from very good to very bad. If in addition the intraocular pressure increases, the prognosis takes a further turn for the worse." I must express complete agreement with these opinions and am convinced that a canvass of ophthalmologists would raise not one dissenting voice.

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An analysis is made of 87 cases of concussion injury of the globe, in 40 of which (46 per cent) hyphemas were present, and in 7 of which (5.7 per cent) secondary hemorrhage occurred. The prognosis in the latter type of case is bad.

The author is not in entire agreement with the theory that such hemorrhages are caused solely by the reactional rise in intraocular pressure. In his opinion, a deficiency in female hormone may have significant bearing on the question.

Opinions differ also as to treatment. The author describes his own methods and cites those of others, emphasizing the fact that careful observation of the intraocular pressure should be maintained throughout.

The statement just quoted presents a serious challenge to all who have to do with traumatic surgery. The problem appears to revolve around the question: Why does secondary hemorrhage develop in certain cases when in others the injury goes on to complete resolution without such an incident? This is the problem which has initiated the following study of cases. Eighty-seven concussion injuries to the globe were encountered in the past three years of practice, and of these 40 had hyphema. Of these 40 patients secondary hemorrhage developed in 7. In this group of 7 cases, 3 eyes are, for practical purposes, lost. One has had to be enucleated, and 2 have little more than light perception. The other 4 patients did reasonably well. Two of them returned to 20/20 vision, and another, who is still being followed after months of reduced vision, is slowly improving as the vitreous clears. Vision is now 20/40.

Typical History. — The eye is usually damaged by some flying object. In some cases the injury may be light, as in the case of 1 patient in this series, in whom a secondary hemorrhage developed and who did very badly. He was hit by no

heavier object than a piece of paper, which was being used as a work order at the office in which he worked. Some injuries were very severe as from a golf club, baseball bat or flying ball. In other cases the object was smaller and traveling at high velocity, e.g., the head of a nail. Nails have caused 20 of the injuries noted, i.e., 23 per cent, which is a disproportionately high incidence. BB pellets have taken toll in 5 cases, and sports, such as golf and hockey, have produced quite a number of accidents.

The history in these cases reveals a blow on the eye. The hyphema may be small, with a slight clouding of the anterior chamber due to blood mixed with the aqueous. Dilation and fixation of a pupil, due to traumatic mydriasis, is commonly observed; in other cases the iris may still be active. Of course, in some instances the hyphema is not the worst result of the accident, as there may be injury to, or dislocation of, the lens, or serious injury to the retina causing visual loss to a severe degree. Certain patients have presented themselves not in the initial stage at all but after the secondary hemorrhage has taken place. This has occurred in at least 2 instances in the group of cases under review. In the series cited by Wilson and others,[2] 9 of the 27 patients were seen only after secondary hemorrhage had developed. Presumably the initial hyphema was so small as to have escaped notice either by the relatives or by the physician. It should be emphasized, therefore, that physicians in general practice must be warned of the possibility of secondary hemorrhage and the grave prognosis when it occurs, so that even the slight hyphema will be observed carefully from the very beginning and prophylactic treatment will be given.

Another factor that contributes to failure to detect this lesion in a certain number of cases is the fact that hyphema can exist with little or no pain. Headache is not a characteristic of the early hyphema due to trauma. On about the third to the fifth day, however—usually the third, in my experience—there may be a sudden onset of pain in the eye, with severe headache. This usually means the onset of secondary hemorrhage or iritis due to the presence of blood in the anterior chamber. In the series here presented, the latter seems to be the less frequent cause. The sudden onset of headache, then, in a patient with a concussion injury to the globe, is usually the herald of a "headache" for the surgeon, and he and the patient usually suffer together during the whole time of trouble, which may be a considerable period.

Cause of Secondary Hemorrhage.—This is the basic problem to be solved if treatment is to be scientific and not merely empiric. There appears to be general agreement that the severity of the injury plays no significant part. Injuries that produced very small hyphemas and were not very severe have produced gross secondary hemorrhage. On the other hand, severe trauma from a golf club or hockey puck has resolved without any such accident. There also appears to be routine agreement that no demonstrable defect is found in the bleeding and clotting times and that there is no obvious reduction in the blood calcium level.

It has been argued that because secondary hemorrhage occurs at the time, when there is a reactional rise in the intraocular tension, the two are cause and effect. It is true that there is reduction of pressure in the contused eye, which is restored in about three to five days. The reduction in pressure will occur, however, in all traumatized eyes, while secondary hemorrhage occurs only in a small proportion.

This theory, nevertheless, does not appear to explain the condition in all cases. According to the work of Vail[3] on the use

of Diamox after cataract extraction, there was no reduction in the incidence of hyphema over that of the control series. In 1 of the cases reviewed in this series the question of reactional rise in pressure appeared to be important. A 13-year-old boy was hit in the eye with a golf club. There was a hyphema of moderate degree, but there was no sign of any other lesion that could be detected on routine examination. The boy was confined to the hospital and kept on strict bed rest, with sedation. On the third day acute pain developed in the affected eye, and examination revealed that the anterior chamber was full of blood. There was severe chemosis, so that it was hard to retract the lids, and the conjunctiva appeared to protrude between the lids so that the eye could be closed only with difficulty. The diagnosis of orbital hemorrhage was made. The patient was seen in consultation by a colleague, and it was decided that Diamox should be continued and the patient carefully observed. The ocular condition finally settled down, but there was a fibrotic membrane across the pupil, and it was obvious, when the chemosis subsided, that there had been some rupturing of the globe, causing a staphyloma. Duke-Elder[4] has pointed out that tearing of the sclera occurs on the inner layers first. In the case under discussion the sclera must have been partially ruptured by the blow, but with the rise in tension in the eye on the third day the weakened sclera stretched, causing severe hemorrhage into the eye and orbit.

Thygeson and Beard[1] cited the experimental work of Kilgore with the traumatized eyes of monkeys. Hemorrhage was observed in the region of the ciliary body and the choroid, with some detachment of these structures in a localized area. This would explain the fact that the hemorrhage, when it occurs, often involves both the anterior and the posterior segments of the eye. Recently I have been impressed by the publications of Jacobsen[5] and the evidence he produces for the use of female hormone in the arrest of hemorrhage. In the last few cases of my own series this therapy has been routine, but not enough cases have been obtained to justify a definite opinion as to whether this will act prophylactically.

Treatment.—The patients are all confined to the hospital and strictly observed. They are kept in bed, with both eyes bandaged and with sandbags to the head. Sedation is given in the form of tranquilizers. A diet rich in Vitamin C is stressed, and Synkavite and Chromadren tablets are commonly employed for their antihemorrhagic value. In the last 6 cases Premarin has also been used instead of Chromadren. On the basis of the work of Jacobsen[5] it was decided to try intravenous Premarin. Since the first case available, however, was that of a child who had multiple allergies, skin testing was indicated. This showed that the child was sensitive to the product, or to the vehicle in which it was made up. As the hemorrhage had occurred in the eye but was not continuing, the role of Premarin could only be considered prophylactic, so undue risk was not justifiable. Oral administration of the hormone was thought to be adequate as a test of its effectiveness in preventing secondary hemorrhage. As this does not normally occur until three days after the original accident, the oral administration of 1.25 mg. three times a day should be sufficient for therapeutic trial. So far no secondary hyphema has occurred in the last 6 cases, but obviously this cannot be considered statistically significant. Investigation is, therefore, continuing.

COMMENT

As has been observed by Shea[6] and others, in the majority of cases the lesion resolves quite well on conservative treatment. Unless there is some other damage

due to the trauma, the hemorrhage is usually absorbed and vision returns completely. Wilson and his associates[2] have recommended the injection of air into the anterior chamber. The wisdom of this procedure is open to question, owing to the fact that most patients will do perfectly well without it. It seems inadvisable to put a patient through this extra procedure, which entails some risk, when there may be no real need for it. Shea[6] has opposed this form of therapy on the same grounds.

Wilson and his co-workers[2] disparaged the use of bilateral bandaging. With this I disagree, and I employ bilateral occlusion of the eyes, particularly in children who accept this form of therapy well. It is the only practical way to keep them quiet without oversedation. Adults accept bilateral bandaging with considerably less grace than do children.

In all the patients in whom secondary hemorrhage has developed, there has been a marked element of nervous tension. This would fall in line with observations of Jacobsen.[5] Female hormone deficiency is associated with tenseness.

There is some disagreement among ophthalmologists as to the use of mydriatics and miotics. Würdemann[7] and Dunnington[8] have recommended atropine; Cordes and Horner,[9] miotics. In a case of acute involvement I use neither. Duke-Elder[10] and Wilkinson[11] and Folken[12] concur in this. It is their opinion and mine that, as the iris has already been traumatized enough to produce hemorrhage, pulling on the iris, either to dilate or to contract the pupil, is merely meddlesome. Blood in the anterior chamber does not normally act as an irritant until it has been present for about a week. In most instances, the hemorrhage has resolved in three to four days. When the hyphema has cleared, the pupil is thoroughly dilated with a mydriatic so that the fundus can be searched for further lesions. If the hemorrhage has not been absorbed in a week, a mydriatic is used, as frequently congestion of the eye is increased by secondary irritation of the iris.

In cases of secondary hemorrhage, a regimen of Diamox and heavy sedation is established immediately. By this means the pain is frequently controlled and the hemorrhage stopped. If the pain persists, there is almost certainly a secondary glaucoma, and if this is not controlled in about twenty-four hours it is usually necessary to wash out the anterior chamber. This procedure is adopted as a last resort, because it is technically extremely difficult, with a completely black anterior chamber, to enter it and wash it out. This has been necessary on 3 occasions in my series.

I am convinced that if the anterior chamber has to be evacuated of blood clot an iridectomy should be done, if possible, at the same time. In 2 of the 3 cases aforementioned this was not done, and secondary glaucoma recurred. In the third case the condition is resolving quite well. Particularly in a child, the decision to perform an iridectomy always causes considerable thought from the point of view of disfigurement. It would appear, however, that if the eyes are going to be lost because of secondary glaucoma and blockage of the angle by the fibrinous exudate from the hemorrhage, then the cosmetic result will be much worse in the end.

SUMMARY AND CONCLUSIONS

An analysis is made of 87 cases of concussion injury of the globe, in 40 of which (46% of the injuries) hyphema was present. There were 7 cases of secondary hemorrhage, 5.7 per cent of hyphema. The prognosis in these cases is bad.

The cause of secondary hemorrhage is discussed. Some divergence of opinion exists as to its cause. The author is not entirely satisfied that the reactional rise in intraocular pressure is the sole cause of

secondary hemorrhage. There appears to be some reason to feel that a deficiency of the female hormone may play a part in distinguishing those patients in whom secondary hemorrhage occurs from those in whom it does not. Neither miotics nor mydriatics are used in the early stage of hyphema, but after a week, if the hemorrhage is not absorbed, mydriatics are used to combat the secondary iritis.

A careful watch on the intraocular pressure is maintained throughout. Irrigation of the anterior chamber should be done reasonably early and should be combined with an iridectomy when there is secondary glaucoma not controlled by the use of Diamox.

ZUSAMMENFASSUNG UND SCHLUSSFOLGERUNGEN

Es liegt eine Untersuchung von 87 Fällen von Stossverletzungen des Augapfels vor, von denen 40 (46%) eine Vorderkammerblutung aufwiesen. Sieben Fälle, d.h. 5,7% der Fälle mit Vorderkammerblutung, zeigten sekundäre Blutungen. Die Prognose in diesen Fällen ist schlecht.

Es wird auf eine Erörterung der Ursache sekundärer Blutung eingegangen. Die Ansichten darüber gehen auseinander. Den Verfasser befriedigt die Erklärung nicht ganz, dass der reaktive Anstieg des inneren Augendruckes als einzige Ursache der sekundären Blutung anzusehen sei. Er hat offenbar Gründe für den Eindruck, dass ein Mangel an weiblichem Geschlechtshormon bei der Unterscheidung von Kranken, bei denen eine sekundäre Blutung auftritt, von denen, wo sie ausbleibt, eine Rolle spielen mag. Im frühen Stadium einer Vorderkammerblutung werden weder pupillenverengernde noch pupillenerweiternde Mittel angewandt; nach einer Woche jedoch werden, wenn die Blutung nicht absorbiert ist, pupillenerweiternde Mittel zur Bekämpfung der sekundären Regenbogenhautentzündung verabreicht.

Während der ganzen Dauer der Behandlung wird der innere Augendruck sorgfältig überwacht. Eine Ausspülung der vorderen Augenkammer sollte in vernünftigen Grenzen ziemlich früh erfolgen und, wenn ein sekundäres durch Verabreichung von Diamox nicht kontrollierbares Glaukom vorleigt, mit einer Iridektomie kombiniert werden.

RIASSUNTO E CONCLUSIONI

Vengono riferiti 87 casi di lesioni commotive del globo oculare, in 40 dei quali (46% sul totale dei traumi) vi era emorragia; vi furono 7 casi di emorragia secondaria (5,7% delle emorragie). La prognosi in questi casi è cattiva.

Viene discussa la causa dell'emorragia secondaria, che non sempre è chiara; l'autore non crede che tale causa sia l'aumento reattivo della pressione intraoculare. Egli ha ragione di credere che una deficienza di ormone femminile possa avere importanza. Nelle fasi iniziali dell'ipoema non si usano nè miotici nè midriatici; dopo una settimana, se l'emorragia non si è riassorbita, i midriatici trovano il loro impiego per combattere l'irite secondaria.

Bisogna seguire con cura le variazioni della pressione intraoculare. Le irrigazioni della camera anteriore debbono essere cominciate abbastanza presto e debbono essere associate all'iridectomia quando vi è un glaucoma secondario che non cede all'uso del Diamox.

RESUMEN Y CONCLUSIONES

Se hace un estudio de 77 casos de traumatismos contusos del globo ocular, cuarente de ellos conhemorragia en cámara anterior (o sea un 46% de los casos).

En 7 casos la hemorragia fue secundaria (5'7% de hemorragias), lo que significa un mal pronóstico.

Se discute cual es la causa de la hemorragia secundaria, pues existen ciertas di-

vergencias en este problem. El autor no cree que la única causa sea el aumento de presión intraocular secundaria al traumatismo. Hay razones para pensar que un déficit en la hormona femenina puede hacer que ciertos enfermos tengan hemorragia secundarias y otros no. Ni las mióticas ni las midriáticas deben usarse en el primer momento de la hemorragia; pero sí ésta no se reabsorve al cabo de una semana, hay que prevenir una aritis secundaria mediante la administración de midriáticas.

Hay que vigilar en todo momento la presión intraocular; cuando se presenta un glaucoma secundario resistente a la terapéutica con diamax, conviene hacer enseguida una irrigación de la cámara anterior combinada con una iridectomía.

RÉSUMÉ ET CONCLUSIONS

Une série de 87 cas de lésions du globe oculaire par choc ou ébranlement est analysée, sur lesquels 40 (46%) présentaient un hypohéma. 7 cas ont fait une hémorragie secondaire, soit 5,7% des cas d'hypohéma. Le pronostic est mauvais dans ces cas.

La cause de l'hémorragie secondaire est discutée; il existe à son sujet des divergences d'opinions. L'auteur déclare n'être pas entièrement satisfait par la théorie selon laquelle elle est attribuée à la seule augmentation réactionnelle de la pression intraoculaire. Il semble que l'on soit en droit de penser aussi au rôle joué par une déficience en hormones femelles qui différencie les cas avec et sans hémorragie secondaire. Ni les myotiques ni les mydriatiques ne sont utilisés au stade de début de l'hypohéma, mais l'on applique des mydriatiques après une semaine si l'hémorragie n'est pas résorbée, pour combattre une iritis secondaire.

Il faut continuer à surveiller attentivement la pression intraoculaire. Une irrigation raisonnablement précoce de la chambre antérieure est indiquée, associée à une iridectomie en cas de glaucome secondaire ne réagissant pas au Diamox.

SUMARIO E CONCLUSOES

Faz uma analise de 87 casos de concussão do globo ocular dos quais 40 (46%) das lesões, apresentavam linfedema. Houve 7 casos de hemorragia secundaria, e 5.7% de linfedema cujo prognostico foi mau. Discute as causas das hemorragias secundarias. Acentua as diferentes opiniões a respeito da etiologia. O A. não esta completamente satisfeito com a suposição de que a hipertensão intraocular seja a unica da hemorragia secundaria. Pensa que uma deficiencia do hormonio feminino desempenha um papel na distinção dos casos em que a hemorragia secundaria ocorre e nos que em que nao existe esta influencia. Não usa os mioticos nem os midriaticos nos estagios iniciais e somente apos uma semana se a hemorragia nao foi absorvida usa os midriaticos para combater a iriti secundaria.

Fiscaliza a pressao intraocular e diz que a irrigação da camara anterior deve ser praticada razoavelmente cedo e que deve ser combinada com uma iridectomia quando ha glaucoma secundario nao controlavel pelo uso do Diamox.

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Comminuted Fractures of the Acetabulum: Central Dislocation of the Femoral Head

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COMMINUTED fracture of the acetabulum with central dislocation of the femoral head into the pelvis is a relatively uncommon injury, but it is sustained with sufficient frequency that an acceptable and simple method of treatment should be available to those confronted by the problem. In the textbooks on fracture[1] the procedures outlined include traction, either skeletal or of the skin; the use of lateral skeletal traction apparatus;[2] manipulation under anesthesia; manipulation through the rectum[3] and open procedures into the pelvis, with metallic fixation with screws or plates[4] to hold the reduction. With the multiplicity of methods employed, one may rightfully question their efficiency or their applicability to the case at hand. One of the methods offered is the turnbuckle method of Jahss,[5] which depends on gradual leverage to produce the desired result. The method here offered is a modification of this, motivated by the limitations of the original procedure. The materials needed are always readily available; the disturbance to the patient is minimal; the reduction obtained is rapid; there is no need of anesthesia, and the patient need not be moved from his bed. In our series of cases there were other injuries, and their care was not compromised or rendered any more difficult by our use of this procedure.

Method.—Bilateral long leg plasters are

The method of treatment here proposed for comminuted acetabular fracture with central dislocation of the femoral head is the authors' modification of the Jahss turnbuckle procedure, which depends on gradual leverage to produce the desired result. Five cases of this type of fracture in patients ranging in age from 22 to 67 are reported, in all of which this technic was employed. An opportunity to allow earlier weight bearing than might otherwise be expected is one of its advantages. As to the long-term results (approximately six years after treatment), objectively speaking, there is some limitation, primarily in internal and external rotation, but subjectively the results are satisfactory; the patients report good function, with no limp. Only one complains of stiffness and aching after prolonged activity.

Read at the Fiftieth Anniversary observance of the Hospital for Joint Diseases.
Submitted for publication Aug. 5, 1957.

applied from high on the groin to the tip of the toes. These plasters must be well padded along the entire length of the medial and lateral aspect of the leg. The heels must be carefully protected by a "cut-out" of felt, so that direct pressure over the os calcis is prevented. Sponge rubber for padding is to be avoided, since this tends to keep the skin moist and allow maceration. When these plasters are dry, a block of wood with a small wedged indent cut into each end, 6 by 4 by 1½ inches (15 by 10 by 3.2 cm.), is placed between the upper medial aspects of the plasters, thereby placing the legs in wide abduction. At the ankles a piece of light rubber tubing of the type used for infusions is placed around both plasters, drawn moderately taut and tied or held by means of a heavy Kocher clamp. Excessive tension on the rubber should be avoided, since the leverage effect here is excellent. To prevent friction between the plasters and the bed, one should place a board transversely in the bed and rest the plasters on a pair of roller skates, with the wheels parallel to the rubber tubing. This allows for the full effect of the medial traction. If these rollers are not readily available, one may suspend each leg plaster by a rope to the overhead frame, thereby securing the same unopposed effect. After reduction has been obtained, the upper block of wood is incorporated into the leg plasters, and a crossbar attached at the ankle level replaces the tubing. This converts the apparatus into a fixed plaster that includes the well leg, thereby holding the pelvic fracture and the reduced dislocation in the desired position for healing (Fig. 1).

REPORT OF CASES

CASE 1.—I. L., aged 40, was injured on Oct. 31, 1946, by a 30-foot fall from a telephone pole, sustaining a comminuted fracture of the right acetabulum with central dislocation of the head of the right femur and distal comminuted fracture of the right radius and ulna. Bilateral long leg plasters were applied with turnbuckles on November 5. External rotation of the plasters was the primary recurrent problem; therefore, the substitution of the method described was undertaken at this point on November 11. The central dislocation was reduced in seven days. The period of total immobilization in rig and plaster was fifty-five days. Weight bearing was successful eighty days after the injury.

CASE 2.—F. W., aged 22, was injured on Oct. 22, 1949, in an automobile accident when a second car struck the side of his automobile, sustaining a comminuted fracture of the right

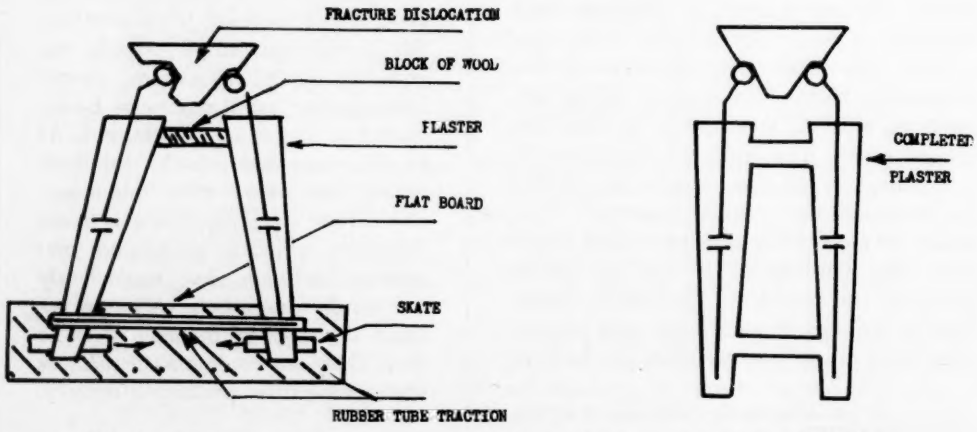

Fig. 1.—Schematic diagram showing method of reduction and final immobilization.

side of the pelvis and acetabulum with central dislocation of the femur into the pelvis. He was treated with bilateral long leg plasters and rubber traction with a wooden block in the groin. Reduction was complete in three days. The total duration of immobilization was forty-seven days. Weight bearing was successful in eighty-nine days. An immediate complication, ulceration of both heels, was encountered.

Follow-up examination seven years after the injury, with comparison of all motions of the right and the left hip, revealed limitation of flexion, 20 degrees; external rotation, 15 degrees; internal rotation, 25 degrees, and abduction, 20 degrees. The patient complained of an ache and a feeling of stiffness after prolonged standing or sitting. At the time of writing, full working assignments are discharged without difficulty (Fig. 2, *A*, *B* and *C*).

CASE 3.—K. T., aged 67, was injured by falling on the lateral aspect of the left hip on July 19, 1950, sustaining fracture of the acetabulum with central dislocation of the head of the femur. A rig was applied, with use of a skate and a board. Recheck roentgenograms reveal withdrawal of the femur from the pelvis in five days. Total immobilization was removed in thirty-three days and weight bearing allowed in fifty-five days.

Follow-up examination after six years, with comparison of all motions of the right and the left hip, revealed limitation of external rotation, 20 degrees, and of internal rotation, 20 degrees. There were no subjective complaints, and no limp was present.

CASE 4.—B. P., aged 26, was injured on Aug. 18, 1950, by an automobile while crossing a street, sustaining a comminuted fracture of the acetabulum and pelvic rami, with central dislocation of head of femur on the right. A rig was applied, and a recheck film showed complete reduction in six days. The period of total immobilization was forty-two days. Weight bearing was allowed in fifty-eight days. This case was complicated by ulceration of both heels.

Follow-up examination after six years, with comparison of all motions of the right and the left hip, revealed 25 degrees of limitation of external rotation, 10 degrees of internal rotation and 5 degrees of abduction. There were no subjective complaints, and no limp was present (Fig. 3, *A* and *B*).

CASE 5.—S. W., aged 62, was injured July 10, 1950, when she fell down a flight of steps.

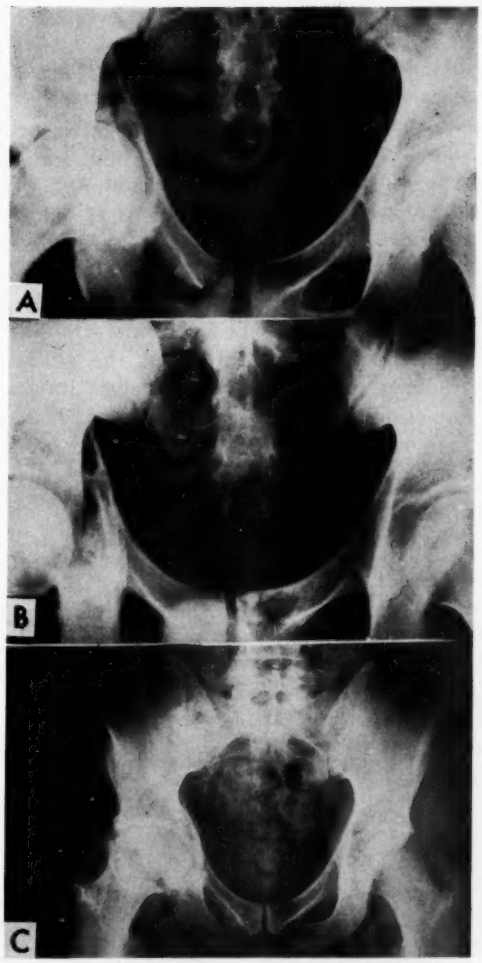

Fig. 2 (Case 2).—*A*, fracture dislocation before application of apparatus. *B*, reduction obtained in apparatus. *C*, end result seven years later.

She was treated at a county institution for three weeks by straight leg traction, without reduction. She was in a leverage traction rig for twenty-one days and in fixation plaster an additional seventy days.

Follow-up examination in less than five years revealed flexion of 90 degrees, extension of 180 degrees, internal rotation of 30 degrees, external rotation of 40 degrees and abduction of 60 degrees. This case was not directly under our control.

COMMENT

Of the patients treated in succession by this method, 3 of the initial 5 returned for reexamination after at least six years; a follow-up examination of the fourth was made in less than five years and was reported as showing an excellent range of movement, but this is not available for additional recheck (county case).

With this method, the wood block between the thighs acts as a fulcrum. The pull of the rubber tubing at the ankles produces gradual and relatively painless reduction of the dislocated femoral head. This outward leverage at the hips creates a direct reversal of the line of force that caused the original injury and displacement of the femoral head, the bones of the acetabulum and the lateral pelvic wall. The maximum withdrawal of the head of the femur is determined by the joint capsule, and this structure is intact, since original displacement is inward. Alignment of those fragments of the pelvis and acetabulum that are attached to the capsule will improve during the reduction. No attempt is made to alter the position of fragments not affected by the reduction. On withdrawal of the head of the femur, the hematoma from the fracture site will fill the space; this is followed by the formation of callus and its conversion either into mature bone or into mature fibrous tissue. This will give a satisfactory medial wall to the hip joint. The form taken by this fibrous tissue or callus will be secondary to the shape of the head of the femur. This shaping process is encouraged by allowing the patient to move his trunk freely in the apparatus. Since the weight-bearing surface of the acetabulum is superior and posterior, the acetabular fracture only partially affects this area, which is to the patient's eventual advantage. The circulatory factor should be kept in mind with reference to the head of the femur. The blood supply of the femoral head is primarily from the capsule, from intramedullary supply through the neck and into the head, and through the ligamentum teres into the head. Unlike the other types of dislocation, the primary injury here is to the ligamentum teres, with the blood supply of the capsule and shaft remaining relatively intact. This reduces the incidence of aseptic necrosis but does not necessarily eliminate it. One may also anticipate a return to the original position of invagination if the reduction is delayed too long, as in Case 5, in which an interval of three weeks was allowed to elapse before the reduction, since the hematoma and fibrous tissue have already taken shape during this period of delay. It does, however, give the patient an opportunity for earlier weight bearing than might otherwise be expected.

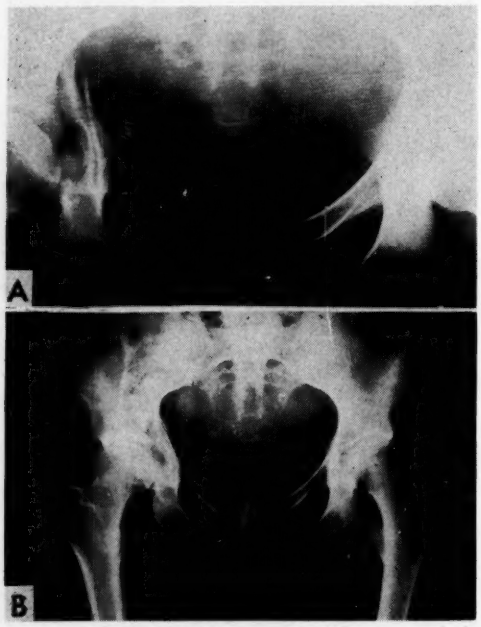

Fig. 3 (Case 4).—*A*, reduction of fracture dislocation in apparatus. *B*, end result six years later.

The time necessary for actual reduction

is between three and six days. Beyond this, the total fixation time was six weeks, and weight bearing was permitted in approximately ten weeks from the date of injury. As more familiarity with the method was acquired, the interval of traction prior to the fixation was reduced, and even the period of total fixation was shortened, without loss of reduction.

The disadvantages of the method are (1) immobilization of the uninvolved leg as part of the apparatus and (2) the development of pressure sores, primarily over the os calcis. One should either cut a hole in the felt to decrease pressure here, or cut the plaster from side to side in the form of a U and pry this section partially free to reduce the pressure. Care in this will tend to prevent most discouraging pressure sores.

The final judge of the advantages of a method after a six-year follow-up is really the patient. Objectively the limitation is primarily in internal and external rotation, but subjectively the patients report good function and no limp. Only 1 complained of ache and stiffness after prolonged activity.

ZUSAMMENFASSUNG

Das Verfahren, das hier zur Behandlung von Splitterbrüchen der Hüftgelenkspfanne mit zentraler Dislokation des Oberschenkelkopfes vorgeschlagen wird, besteht in einer von der Verfassern modifizierten Anwendung der Jahss' schen Drehschnalle, die durch allmählich gesteigerte Hebelwirkung zum gewünschten Erfolg führt. Es wird über fünf derartige Frakturen bei Kranken im Alter von 22 bis 67 Jahren berichtet, die alle mit dieser Technik behandelt wurden. Zu den Vorzügen des Verfahrens gehört die Möglichkeit, Gewichtsbelastung frühzeitiger zu gestatten, als man sonst zu tun gewöhnt ist. Was die langfristigen Resultate betrifft (etwa sechs Jahre nach der Behandlung), so muss man objektiv sagen, dass es zu einer Bewegungseinschränkung besonders der Innen- und Aussenrotation kommt, die Resultate jedoch subjektiv befriedigend sind; die Kranken berichten über gute Funktion und hinken nicht. Nur einer von ihnen klagt über Steifheit und über Schmerzen nach ausgedehnter Aktivität.

RIASSUNTO

Il metodo proposto nella cura delle fratture comminute dell'acetabolo rappresenta una modificazione di quello di Jahss, basato sullo spostamento graduale fino ad ottenere il risultato desiderato. Vengono riferiti 5 casi di tali fratture, in malati fra i 22 e i 67 anni di età, nei quali venne usata questa tecnica. Uno dei vantaggi è rappresentato dalla possibilità di consentire il carico molto più precocemente che con qualunque altro metodo. Quanto ai risultati a distanza, a circa 6 anni dopo la cura vi è una limitazione dei movimenti di rotazione interna ed esterna, ma soggettivamente i risultati sono buoni; il malato è soddisfatto e non zoppica, si lagna soltanto di una certa rigidità e di dolore dopo attività prolungata.

RÉSUMÉ

Une nouvelle méthode thérapeutique est proposée pour la fracture comminutive de la cavité cotyloïde avec dislocation centrale de la tête fémorale, qui est une modification de la technique de Jahss. Cinq cas sont décrits où l'âge des malades varie de 22 à 67 ans. L'un des avantages de cette technique est de permettre de supporter plus précocément qu'aucune autre le poids du corps. Objectivement les résultats éloignés—environ six ans après le traitement—montrent une rotation interne et externe limitée, mais les résultats subjectifs sont satisfaisants et il n'y a pas de boîterie. Un seul malade se plaint de raideur et de douleurs après une activité prolongée.

RESUMEN

Se propone un método para la fractura conminuta del acetábulo con luxación central de la cadera y que es una modificación del casquete acetabular de Jahss. Se presentan 5 casos de esta fractura en enfermos entre 22 y 67 años en todos los cuales fue empleada esta técnica. Una de las ventanas del método es la oportunidad de comenzar el aproyo en el miembro afecto mucho más pronto que con otros métodos. Los resultados tardíos (aproximadamente a los 6 años después del tratamiento) muestran objetivamente una limitación en la rotación externa e interna, pero subjetivamente es de un resultado satisfactorio, ya que los pacientes muestran una buena función y no cojean. La única queja es cierta rijidez y un dolor después de la actividad prolongada.

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Simpson, like most of the Scotchmen of that day, had been raised upon the Bible as well as upon oats. He counter-attacked both dissenting physicians and objecting clergymen. He pointed out to the doctors that when Jenner introduced vaccination against smallpox, Dr. Rowley argued that "smallpox is a visitation from God, and originates in man, but the cowpox is produced by presumptious, impious man. The former, heaven ordained; the latter is perhaps a daring and profane violation of our holy religion. The projects of these vaccinators seem to bid bold defiance to heaven itself, even to the will of God." He called the attention of the theologians to "the details of the first surgical operation ever performed on man," when "the Lord God caused a deep sleep to fall upon Adam, and he slept; and He took one of his ribs, and closed up the flesh instead thereof." Simpson further quoted John Calvin, who observed that "Adam was sunk into a profound sleep in order that he might feel no pain," and argued that anaesthesia could not be impious, since the Lord Himself had employed it.

—*Major*

Complications of Malignant Disease: Surgical Management of the Left Side of the Colon and Rectum

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ANY comment upon the surgical treatment of carcinoma of the colon must be related to one's personal experience. When one has had adequate contact with this major problem, all the complications must have presented themselves many times. An analysis of each of these complications will materially formulate some positive conceptions with regard to future management of similar situations.

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In the author's opinion, palliative colostomy for carcinoma of the colon is ill-advised and is to be condemned. Lesions complicated by local extension of the malignant growth or by involvement of adjacent structures should be treated by palliative resection rather than colostomy, even when cure is known to be impossible, since it will add much to the patient's comfort and duration of survival. For low-lying rectal lesions the author has advocated anterior resection in certain cases, but at the same time has upheld the merits of abdominoperineal resection with a permanent colostomy.

Palliative colostomy is usually a procedure to be condemned. It gives no palliation and adds little to the patient's life; on the contrary, it contributes much to his discomfort. It has done much to discredit colostomy performed for removable lesions. The pain and discomfort accompanying an unremoved malignant lesion are attributed to the colostomy rather than to the progress of the disease. The uncontrollable nature of the colostomy is in large measure due to reverse peristalsis of the distal segment of the colostomy, regardless of the type of colostomy performed.

A palliative colostomy is indicated only in cases of advanced malignant disease associated with impending or actual obstruction. In such instances colostomy can be avoided by anastomosing around the lesion and preserving the fecal current; or, for the brief period of life remaining with an unobstructive lesion, a liquid diet or one without residue will obviate the annoying effects of a terminal colostomy.

Patients who have large fixed lesions or lesions involving adjacent intestines, abdominal wall, pelvic structures, bladder, prostate or posterior vaginal wall have too frequently been declared inoperable, and an ill-advised permanent colostomy has

been done. In former years, because of inexperience and lack of courage, I have performed such an ill-advised operation and have subsequently learned that some more venturesome surgeon has successfully removed some lesions of this type. Likewise, in recent years I have removed lesions from patients previously pronounced inoperable, upon whom a colostomy had been done. I now demand unmistakable evidence of inoperability before I resign myself to inaction. Ability, experience, courage and willingness to accept defeat and an increased mortality rate are essential requirements for the adequate and proper management of these major problems. The successful removal of a seemingly inoperable lesion gives the surgeon a feeling of satisfaction, but the performance of a colostomy for a lesion of questionable operability is not consoling.

Palliative resection may add much to the patient's comfort and length of life and far exceeds in benefit a short-circuit operation around the lesion or a colostomy. Pain and pressure from the growth of the lesion are eliminated by palliative removal. Moderate metastases offer no contraindication to resection, and the removal of adjacent involved structures along with the lesion, when possible, is to be encouraged. Resection in the presence of incurability is, therefore, strongly urged. The patient lives longer and is more comfortable when the lesion is removed.

Associated Lesions.—A diagnosis of carcinoma of the colon does not imply that secondary carcinoma or polyps may not be present elsewhere in the colonic tract. Careful roentgen investigation should be made of the entire colon. If other lesions are associated with the known malignant tumor, operation may be extended to include a wide area of involved malignant or polypoid bowel. On many occasions I have observed associated polyps by contrast enema and have been able to extend the scope of resection and remove the polyps along with the carcinoma. By roentgen study of the colon and by laparotomy, I have detected lesions distal to the one under primary consideration and have removed them by extending the operation or by a secondary procedure.

I have operated upon a number of patients who, within the year, had had a malignant lesion removed from the sigmoid in another hospital. In many I removed a segment of involved abdominal wall, a secondary colonic carcinoma and some associated polyps adjacent to the primary operative site. In others, because of extension, I did a radical excision of the left colon, ovary, tube and often the uterus, as well as many metastatic glands adherent to the iliac vessels. Frequently the surgical specimen showed polyps, which, in my opinion, should have been detected before the primary operation or by colosigmoidoscopic study at the time of operation, and removed along with the carcinoma. Many patients had been operated upon elsewhere by the "obstructive resection" type of procedure, with inadequate removal of the bowel and mesentery. This type of resection once served a useful purpose, but it is now largely obsolete.

By preoperative investigation and wide removal of the bowel and all the mesentery drained by the segment, recurrences will be diminished and the necessity for secondary surgical interventions minimal.

Fixation and Extension.—Fixation is often present with colonic carcinoma, and removal may jeopardize surrounding anatomic structures if caution and care are not exercised in finding a line of cleavage. These important structures may be isolated above or below the fixed lesion, followed to the point of involvement and separated with an increased degree of accuracy and a minimal danger of damage to vital structures. I have found this useful in isolating an adherent ureter or in free-

ing lesions of the iliac colon from the great vessels.

I have extended excision for colonic and rectal carcinoma to include many cases in which, because of fixation and adjacent involvement, I formerly considered the lesions inoperable and did only a colostomy.

Lesions involving an adjacent loop of small bowel are removed *en masse*. Tubes, ovaries and the uterus may be excised along with the carcinoma if adherent and involved. Rectal lesions involving the posterior wall of the bladder have been extirpated together with a segment of the bladder. The anterior abdominal wall in part has been removed, as have the surrounding parietal peritoneum and the underlying muscle, in the presence of lesions of the lateral colon.

In 3 instances the left lobe of the liver was removed during the abdominal phase of an abdominoperineal resection because of a large isolated metastatic lesion. These extensive procedures have not been attended by a high operative mortality rate. Although palliative, they have extended life and made living more comfortable.

Splenic Flexure.— Complications are often associated with carcinoma of the splenic flexure. The lesion is usually advanced and often fixed and obstructive before the patient is seen by the surgeon.

The symptoms before obstruction are abdominal and rather vague. The lesion is high under the costal arch and not palpable.

A barium enema is often misleading, as one limb of the flexure may override the other limb and show no deformity in a case of nonobstructive tumor. This results from a high, fixed contracting lesion that has pulled the two limbs of the flexure into this relation. Only by an oblique exposure, therefore, can the splenic flexure be well visualized and the two superimposed segments distinguished. In a series of 38 lesions of the splenic flexure and the upper segment of the descending colon a preliminary cecostomy was done prior to resection in more than half of the cases, because of varying degrees of obstruction. The remaining patients were operated upon largely by primary resection and anastomosis, with or without complementary cecostomy, depending upon the condition of the proximal colon.

Descending Colon and Sigmoid.—Lesions in this portion of the colon are usually annular or more or less constricting and at the time of consultation show varying degrees of chronic or complete obstruction. Fortunately, most apparent obstructions are not complete neoplastic obstructions but are partly due to associated edema, inflammatory reaction and invaginated mucous membrane into the meager neoplastic lumen. Under proper surgical decompression and with irrigation they relent sufficiently to allow the colon to empty itself partially through the distal segment. Proximal surgical decompression can be produced by cecostomy or transverse colon colostomy, the latter being preferred by many surgeons. In the presence of complete obstruction with extensive distention of the proximal bowel, however, colostomy is not always easy.

Often the distended right transverse colon is pushed high under the costal arch by the enormously distended cecum, which pushes everything well toward the midline and upward, so the transverse colon is not easily approachable. In surgical decompression I have found it often better to deflate the cecum by needle puncture and aspiration, to exteriorize a small segment of the cecum and to apply the cecostomy clamp and insert a catheter into the cecum through the hole in the clamp, than to attempt to isolate an inaccessible distended transverse colon. The danger of manipulation is too great; it may cause rupture. The bowel can be cleansed successfully through a surface or stomal cecostomy, al-

though it may take longer. The viability of the cecum, vulnerable segment of the acutely distended colon, can likewise be determined by cecostomy, which is not possible with transverse colostomy.

Obstruction. — The point of greatest clinical interest is that colonic obstruction is often a closed loop obstruction and is subject to gangrene and perforation at the most distensible segment, the cecum, when the intracolonic pressure exceeds the systolic blood pressure. In this way, obstruction of the colon is comparable to strangulated small bowel obstruction, as no colonic contents are regurgitated into the terminal ileum, and distention progressively increases as the ileum empties its contents into the cecum, with ultimate impairment of the blood supply. Surgical decompression, therefore, should not be long deferred, or gangrene and rupture of the cecum will occur. I have observed this twice. In one instance it developed during preparation for operation. Cecostomy, however, was immediately carried out, and fortunately there was little abdominal soiling; recovery occurred, and subsequent resection of the lesion was successfully done. I have observed impaired circulation to the cecum in other instances. Colostomy would not have prevented later cecal rupture.

Obstruction is easily recognized clinically, the diagnosis being proved by a flat roentgenogram of the abdomen, which shows the distended proximal colon with its haustral markings, or by barium enema. Surgical decompression must be done prior to excision of the tumor. Transverse colostomy limits wide mobilization and excision of lesions of both the splenic flexure and the descending colon which should include the bowel from the distal transverse colon to a joint near the upper sigmoid. Surface cecostomy offers no technical handicap and fulfills all the requirements for decompression and bowel irrigation. It serves also as an excellent vent for the escape of gas and permits free mobility for wide excision and anastomosis without tension.

A spontaneous rupture of the sigmoid into the free abdominal cavity was observed in a man aged 21. On weight lifting a severe abdominal pain occurred, and a diagnosis of a perforated duodenal ulcer was made. The abdomen was boardlike. Operation revealed no ulcer perforation. The abdomen was contaminated, and a pendulous sigmoid revealed perforation of an indurated lesion of the antimesenteric side of the bowel.

This was exteriorized through a left pararectus incision and obstructively resected. A complementary cecostomy was done to prevent intestinal distention and make less probable the development of peritonitis. A Miller-Abbott tube was passed. The peritoneum can withstand much contamination if intestinal distention is prevented. The patient recovered. The bowel opening was later closed, and the patient has been well now for more than twenty years.

Rectosigmoid.—The anatomic classification of carcinoma of the rectum, rectosigmoid and extreme lower sigmoid is not very clear. What the rectosigmoid is, is hard to define. The excised specimen shows no such anatomic structure, except that the serosa is absent below the pelvic peritoneum. It is more appropriate to describe carcinoma of that portion below the pelvic peritoneum as "extraperitoneal carcinoma of the rectum" and that above and below the promontory of the sacrum as "low intraperitoneal carcinoma of the sigmoid."

The lesions are constricting and frequently obstructive; they often require colonic decompression as a preliminary procedure. Primarily or subsequently an anterior type of resection can frequently be done if local conditions are favorable. If the lesion is large or fixed, or if metastatic glands are observed, abdominoperineal resection offers the best chance of re-

moving the involved tissue.

Lesions below the pelvic peritoneum are often unsuitable for excision and bowel reconstruction. The problem always is, can one remove all of the carcinoma and sew the two ends of the bowel together successfully? This has been emphasized by Gilchrist and David.

Anterior Resection.—My approach to determining the indications for anterior resection is related to the extent of the lesion, its distance from the anus and the level below the lesion in which adequate distal bowel excision can be accomplished. Anterior resection with anastomosis is feasible for lesions 5 inches (12.5 cm.) or more above the anus, unless prohibited by extension of local pathologic change. The size of the tumor, the degree of penetration of the lesion and the inflammatory reaction or attachment to adjacent structures may prohibit the reconstruction of intestinal continuity.

For lesions 1 inch (2.5 cm.) or so below this arbitrary line of 5 inches, anterior resection is advisable, provided the lesion is small and unattached and when a margin of 3 or 4 cm. below the tumor can be removed. It is remarkable how often a tumor that appears to be near the anus has a good margin below it when mobilized. It is difficult to estimate in centimeters or inches the distance of the tumor from the rectum on examination before operation. What appears to be a short distance may prove to be much longer when the tumor is surgically mobilized.

I am firmly convinced that for patients whose life expectancy is short because of hepatic metastasis or extensive metastatic nodes, mesenteric or periaortic, anterior resection is far preferable to abdominoperineal resection with its accompanying colostomy. They will live more comfortably for their remaining days and should not be required to contend with a colostomy during that period. This confirms again my repeated opposition to permanent colostomy when it can be avoided. Especially, it supports my position of the removal of carcinoma when possible, even though cure is obviously impossible.

A source of error in doing a low anterior resection is that when the rectum has been mobilized and put on the stretch the bowel may be divided below at a distance that seems adequate but in reality, because of the intestinal tension, is not sufficient. What seems to be 4 or 5 cm. is actually much less. This is demonstrated by measurement when the specimen arrives in the laboratory. Frozen section study of the distal portion of the specimen is valuable in determining the adequacy of bowel removal. It is, however, important that enough bowel be removed to prevent local recurrence at the suture line of the anastomosis, which will result in recurrence of bleeding, constriction, tenesmus and much discomfort.

These low reconstructions often largely represent an effort to avoid performing an abdominal colostomy. Surgical compromise of anatomic excision of all the gland-bearing tissue is at the expense of maintaining a normal fecal current. Why compromise, for sentimental and esthetic reasons, surgical principles in the treatment of carcinoma of the lower part of the rectum? A frank discussion should convince any intelligent person of the advantages of a radical procedure.

The possibility of cure, however, should never be sacrificed to prevent a colostomy. In certain instances a large tumor may be located quite low and with no evidence of distant or mesenteric metastasis but may penetrate deep into the wall and out into the surrounding structures, the prostate, the posterior vaginal wall or the surrounding local glands or muscular structures. It is far better in such instances to do an abdominoperineal resection than an exclusion colostomy. These lesions will continue to progress and bleed if not removed, even though excluded by a colostomy.

An abdominal colostomy properly made, with removal of the primary lesion, can be effectively controlled and will cause a minimum of trouble. The general conception of colostomy is based upon inadequate information, sentiment and mental abhorrence. Those who have colostomies properly performed for removable lesions and who have learned to care for them have little or no trouble. The bowel in time adapts itself to its new environment and functions with a minimum of inconvenience.

I have encountered 257 lesions in the lower sigmoid, rectosigmoid and rectum, which were treated by anterior resection or abdominoperineal resection, more than half by the latter method. The mortality rate for the entire series was 8.09 per cent.

SUMMARY

Palliative colostomy is condemned as often an ill-advised procedure and conducive to much discomfort to the patient. In most instances it can be avoided by procedures discussed in this article. The author also prefers procedures that materially favor retention of bowel continuity rather than colostomy in removal of many low-lying lesions.

Lesions complicated by malignant local extension locally or involvement of adjacent structures, as well as those which present evidence of distant metastasis, are considered for palliative resection rather than colostomy, although a curative procedure is recognized as impossible.

The author has advocated anterior resection under certain stated conditions but at the same time has upheld the merits of abdominoperineal resection with a permanent colostomy for low-lying rectal lesions. His approach to these complicated lesions of the left colon and rectum is expressed as it has evolved through an increasing experience. He would accept this approach for himself if he were the victim of such a lesion, and this, in his opinion, is the approach all surgeons should make to all surgical problems of whatever nature.

RÉSUMÉ

La colostomie palliative est condamée comme étant un procédé souvent peu judicieux pouvant provoquer beaucoup de désagréments pour le malade. Elle peut être évitée dans la plupart des cas grâce aux techniques ici décrites. L'auteur préfère également à la colostomie pour l'ablation de lésions bas-situées, les techniques favorisant une rétention intestinale.

Les lésions compliquées d'une extension maligne locale ou celles s'étendant aux tissus adjacents, comme celles présentant des métastases à distance, sont considérées comme devant faire l'objet d'une résection palliative plutôt que d'une colostomie, cela même dans les cas considérés comme désespérés.

L'auteur recommande la résection antérieure sous certaines conditions bien définies, tout en reconnaisant les mérites de la résection abdominopérinéale avec colostomie permanente pour les lésions rectales bas-situées. II décrit sa technique dans ces cas compliqués de lésions du colon et du rectum du côté gauche, telle qu'elle a évolué avec son expérience croissante. S'il devait être victime d'une telle lésion il accepterait cette méthode pour lui-même, et ill considére que c'est de cette façon que tous les chirurgiens devraient envisager les problémes chirurgicaux quels qu'ils soient.

RESUMEN

El autor condena en este artículo el uso de la colostomía paliativa a la que considera un mal procedimiento y de gran incomodidad para el enfermo. En muchos casos la colostomía puede ser evitada por algún procedimiento enumerado en este artículo. También prefiere el autor los pro-

cedimientos que favorecen la retención de la conservación intestinal. Las lesiones complicadas por extensión maligna o que afectan las estructuras adhiacentes y aún las complicadas con metástasis a distancia deben ser tratadas can resección con preferencia a las colostomías aunque tal proceder sea considerado como incapaz de conseguir una curación.

El autor aconseja la resección anterior bajo ciertas condiciones pero al mismo tiempo reconoce los méritos de la resección abdominoperineal con colostomía permanente en los casos de lesiones rectales muy bajas. La vía de abordaje a las complicadas lesiones de colon izquierdo y recto han experimentado ciertas evoluciones a lo largo de la nueva experiencia. El autor aceptaría esta vía de abordaje para sí mismo si fuera víctima de esta lesión, y éste, a su modo de ver, debiera ser el punto de vista que todos los cirujanos debieran tener ante problemas quirúrgicos de cualquier índole.

ZUSAMMENFASSUNG

Der Verfasser verurteilt das Anlegen einer künstlichen Afters aus palliativen Gründen als ein unkluges Verfahren, das oft dem Patienten zur grossen Last wird. Meistens lässt es sich durch Methoden, die in der Arbeit erörtert werden, vermeiden. Statt Resektion tiefsitzender Krankheitsherde mit Anlegung eines künstlichen Afters bevorzugt der Verfasser Methoden, die im wesentlichen eine Erhaltung der Kontinuität des Darmes zum Ziele haben.

Bei Erkrankungen, die durch örtliche Ausbreitung oder durch Einbeziehung benachbarter Organe oder durch das Bestehen von Fernmetastasen kompliziert sind, hält der Verfasser eine palliative Resektion für ratsamer als die Anlegung eines künstlichen Afters, obgleich er die Unmöglichkeit einer Heilung zugibt.

Der Verfasser tritt unter gewissen Voraussetzungen für die Ausführung einer vorderen Resektion ein, erkennt jedoch gleichzeitig die Verdienste der abdominoperineal en Resektion mit Anlegung eines permanenten künstlichen Afters bei tiefsitzenden Erkrangungen des Mastdarms an. Seine Auffassung von der Behandlung dieser komplizierten Erkrankungen des linken Dickdarms und des Mastdarms ist der Ausdruck seiner wachsenden Erfahrung mit diesen Zuständen. Er würde, wenn er selbst einer solchen Erkrankung zum Opfer fiele, sich den gleichen Methoden unterziehen, und er glaubt, dass alle Chirurgen sich diese Frage vorlegen sollten, wenn sie einem chirurgischen Problem irgendwelcher Art gegenüber stehen.

SUMARIO

Condena a colostomia paliativa como um metodo mau conduzido e que causa serio desconforto ao doente. Em muitos casos essa operação pode ser evitada por metodos que sao descritos neste trabalho. O A. tambem prefere os metodos que facilitam a retensão da continuidade do intestino ao em vez da colostomia para as lesões situadas em nivel baixo. As lesões complicadas pod sisseminação local ou a outras estruturas assim com aquelas em que ha evidencia de metastases distantes são passiveis de resecção paliativa ao emvez de colostomia embora exista a impossibilidade de tratamento cirurgico curativo.

O A. defende a resecção anterior em certas condições bem definidas mas ao mesmo tempo cita os meritos da resecção abdominoperineal com colostomia permanente para as lesões retais baixas. Pela sua experiencia aumentada com o numero de lesões do colo esquerdo e do reto cita a via de acesso preferida para essas complicações.

Diz que a via de acesso que usa a empregaria para si mesmo e concita os cirurgioes a fazerem uso dela para melhorar as condições das tecni cas cirurgicas de qualquer natureza.

RIASSUNTO

La colostomia palliativa viene condannata quale procedimento sconsigliabile e pieno di inconvenienti per il malato. Essa può essere evitata e sostituita con uno dei metodi descritti in questo articolo. L'autore preferisce quei procedimenti che mantengono la continuità intestinale.

Le lesioni caratterizzate da diffusione maligna locale o da invasione delle strutture contigue o da metastasi a distanza, debbono essere trattati con le resezioni palliative piuttosto che con la colostomia, anche quando è impossibile eseguire un intervento radicale.

L'autore preferisce, nei casi adatti, la resezione anteriore ma non disconosce i meriti della resezione addominoperineale. Il suo metodo è frutto dell'esperienza e lui stesso sarebbe disposto a sottoporsi a tale intervento se averse uno di questi tumori. Ogni chirurgo dovrebbe considerare sotto questo aspetto i problemi chirurgici che gli si presentano.

John Hunter had no great literary gifts. His was a world of deeds, not words. Perhaps, too, in his earlier days he was self-conscious about his lack of education and did not find it easy to put pen to paper. His letters to his brother when on active service certainly do not show any special gift. But as he grew older writing became less of a labour, though he never became a master of style or a man of letters. When he did put pen to paper it was with the simple purpose of recording facts accurately and then, if it seemed useful, of making deductions; and his language was terse, direct and without embellishments. Towards the end of his life, as the deductions grew in complexity, he passed into a phase of philosophical speculation in which his meaning was sometimes obscure. Once, having used the word consciousness in a manner all his own, he confessed that he really had no word suitable for his meaning and "to coin words would not answer the purpose because then I must have a dictionary of my own." He disliked definitions: "Of all things on the face of the earth definitions are the most cursed; for if you make a definition you may bring together under it a thousand things that have not the least connection with it." . . . He started out as a writer, therefore, with considerable handicaps, but he had a message and he was determined to deliver it, and the manner and style of its promulgation were to him of no great account so long as he was clearly understood.

—*Gloyne*

Surgery of the Thyroid and Parathyroids

Angiographic Aspects of Disease of the Thyroid

An Evaluation of Subclavian Retrograde Arteriographic Procedures as a Means of Clinical Study

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Angiographic studies conducted by the authors have illustrated many aspects of disease of the thyroid. The number and variety of the pathologic pictures obtained leads them to report their experience. The work has many interesting aspects, the chief of which is the possibility that the technic may be useful in differentiating carcinoma of the thyroid from other disease which, from a clinical standpoint, may suggest malignancy, e.g., Hashimoto's disease. Angiographic study of the thyroid by means of subclavian puncture, in the authors' experience, has proved an easy and efficient method of clinical investigation. They recommend that it be applied to the diagnosis of disease of this gland.

BY outlines of the thyroid as arterial vessels as obtained by injecting a contrast medium into the subclavian artery according to a particular technic, we have obtained some interesting angiographic pictures of the thyroid region in cases of goiter, tumor and other diseases of the thyroid gland. In effect, radiologic study contributes routinely to the diagnosis of various swellings of the gland, by means of simple radiograms and stratographic and by phlebographic investigation of large veins in the upper mediastinum. Recently, angiocardiography has been applied also to the study of intrathoracic goiters, by Miscall and his co-workers; yet these procedures do little more than demonstrate some anatomic and topographic features of the area studied, though in rare cases they may be capable of giving some information about the very nature of the disease. On the contrary, modern arteriography, which is essentially based on serial observation, can afford some important criteria as to the functional aspects of local circulation, which, together with the aforesaid morphologic features, not infrequently allow a judgment to be made as to the nature of the disease in the structure under investigation.

For this reason we considered it worth while to apply this method of clinical study to diseases of the thyroid, assuming

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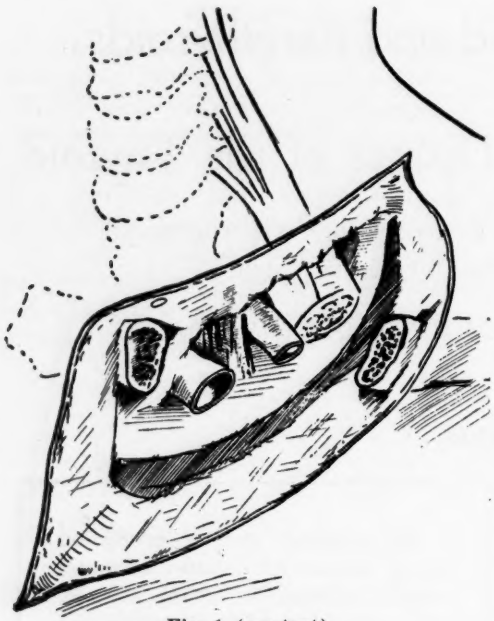


Fig. 1 (see text).

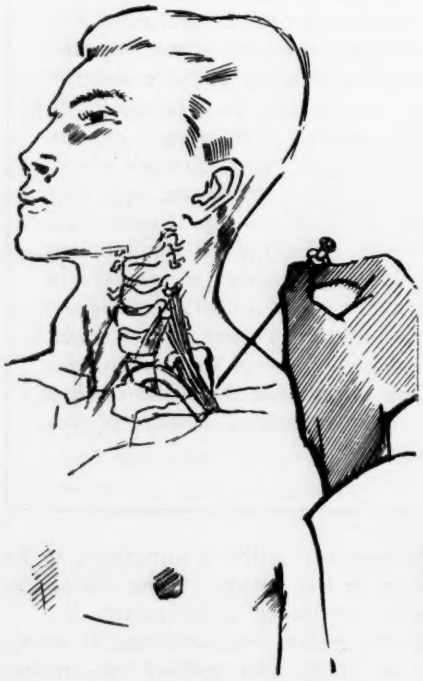


Fig. 2 (see text).

that this gland, which is so richly vascularized, was bound to furnish some data of wide significance through the arteriographic test, provided this was carried out and interpreted properly.

Because of the importance of the lower thyroid artery in the general blood supply of the thyroid gland, owing to the rich intraparenchymatous anastomoses with the homonymous upper arteries, we thought it advisable to introduce the contrast medium through the inferior arteries in order to obtain a good vascular representation of the whole thyroid (Figs. 4, 5 and 12).

The method we have devised for this purpose has proved simple as well as good. The subclavian artery is punctured by following rather closely the Kulenkampf technic for anesthetic block of the brachial plexus by the supraclavicular route; the needle can easily reach that portion of the anterior surface of the first rib which is crossed by both the brachial plexus and the subclavian artery, lying—in close contact—in the space that separates the points of insertion of the sca-

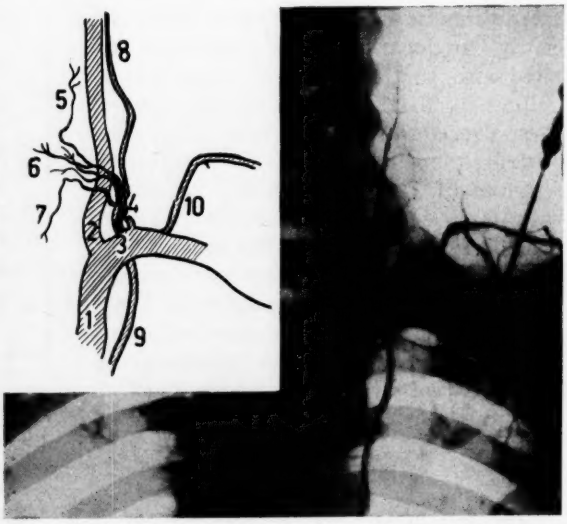


Fig. 3A.—Normal condition, early arterial phase.

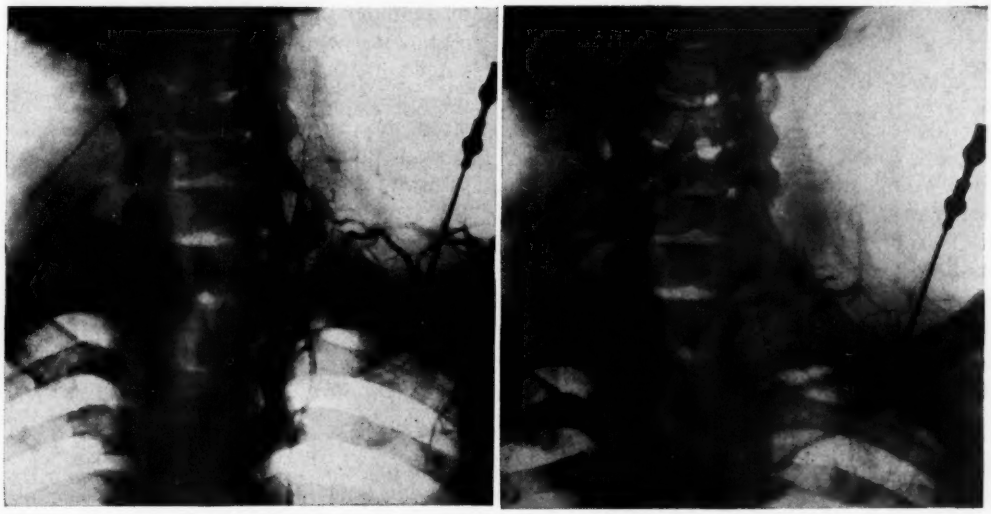


Fig. 3*B*.—*Left*, late arterial phase; *right*, capillary phase.

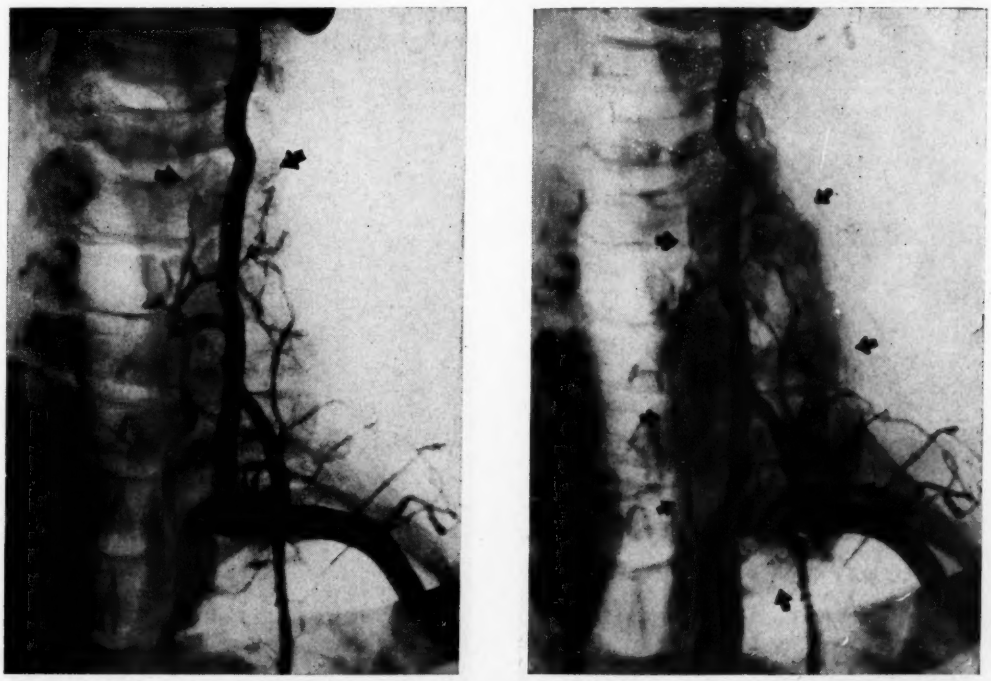


Fig. 4*A*.—*Left*, two seconds after injection of contrast medium. Lower thyroid artery and its branches are larger in caliber than normal. Upward branches reach upper pole of gland (arrows). Near image of trachea, thinnest arteries are also visible. Contour of whole arterial network is even and regular. *Right*, five seconds after injection. Arteriolocapillary bed becomes opaque; goiter tissue begins to stand out among neighboring structures.

lenus medius and the scalenus anticus muscle (Fig. 1). As the rib makes a sort of bony floor to these structures, careful exploration of the region with a needle, in the attempt to puncture the subclavian artery, is made largely safe with regard to the danger of injuring the pleura and other structures.

The patient lies on the radiographic table with a thin pillow under his shoulders and head. The shoulder of the side under examination is depressed, and the muscles relaxed. In fact, when the shoulder is raised by muscular contraction—and with it the clavicle—location of the subclavian artery by palpation, as well as its attainment by the needle, are almost impossible. If the patient is told to "put his elbow on his knee," the lowering of the shoulder that follows makes it possible to palpate the artery, provided the patient is not very fat.

We use a No. 24 wire needle; its length varies, according to the type of patient. In a thin person the subclavian artery, at its crossing of the first rib, is practically subcutaneous. In an obese one it must be reached through a couple of inches of tegument, if not more. On the other hand, after the artery has been punctured, it is undesirable that much of the needle should still project from the skin, as its connection with a syringe by a rubber tubing may easily displace its point, the more so the more it oscillates free from the tissues.

The needle must be inserted above the midpoint of the clavicle. There are some

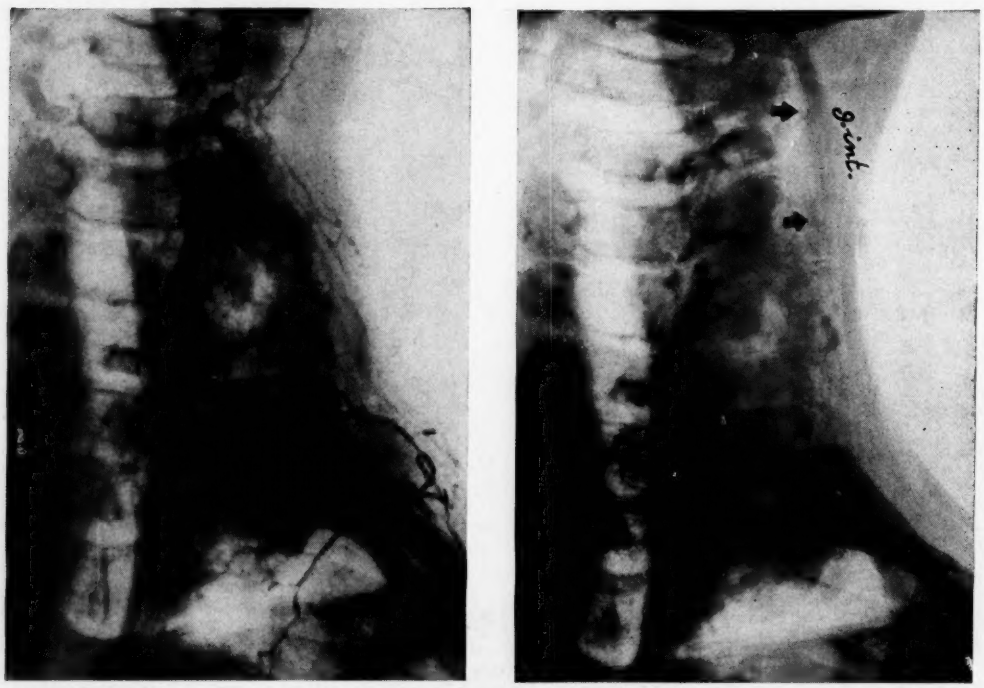


Fig. 4B.—*Left*, seven seconds after injection (capillary phase). Entire left lobe of thyroid intensely stained; arteries practically devoid of contrast medium. *Right*, nine seconds after injection. Internal jugular vein begins to be outlined.

guides to this spot which, though definite in the thin person, may be of little help if the patient is obese. Furthermore, in the presence of a very large goiter, all the landmarks on which one might normally depend may be practically useless and all the anatomic relations upset. At all events, the subclavian artery is the best landmark when it is present and can be palpated. If this artery cannot be palpated, the midpoint of the clavicle can be spotted, as it generally corresponds to the point at which the straight portion of the external jugular vein, if continued, would cross the clavicle itself.

The needle is directed inward, downward and slightly backward (Fig. 2) until its point strikes the bony anterior surface of the first rib. Should the brachial plexus be stimulated by the needle, the conscious patient will complain of a peculiarly sharp pain shooting down the arm. In that case the point of the needle must be withdrawn and pushed down again, a little farther forward. Puncture of the subclavian vein is much less frequent, of course, as the vein is always covered by the clavicle, even when the shoulder is optimally depressed. It gives passage to a few drops of blackish blood.

Puncture of the subclavian artery, unfortunately, does not transmit to the hand the peculiar feeling caused by transfixion of a larger artery (e.g., the abdominal aorta). The rhythmic spouting of arterial

Fig. 5.—Another aspect of vascular goiter (early arterial phase). Lower thyroid artery is dilated and tortuous, its upward branches reaching upper pole of gland.

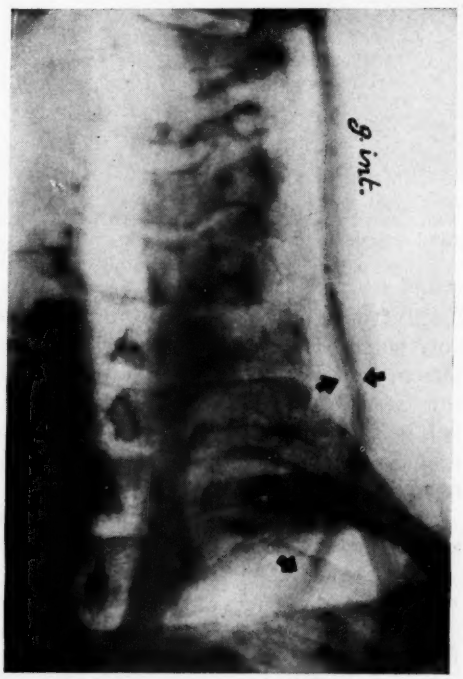
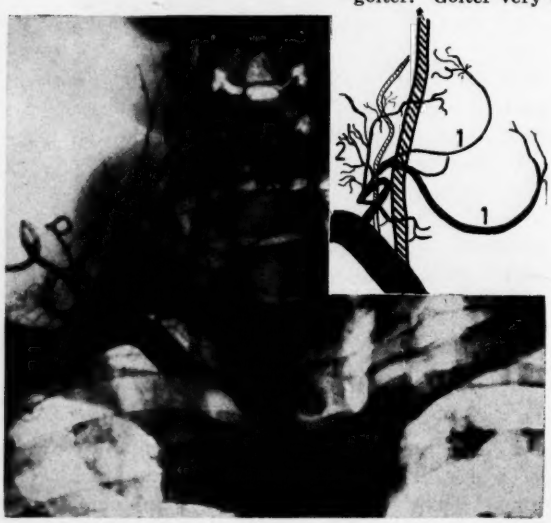


Fig. 4*C*.—Eleven seconds after injection (venous phase). Internal jugular vein entirely opacified, an effect increased by compression caused by goiter (arrows).

Fig. 6.—Early arterial phase. Lower thyroid artery and its branches (arrows) show normal caliber and pattern, distributed regularly to entire goiter. Goiter very thick and opaque.



blood from the needle, therefore, is the only suggestion that one has reached the lumen of the artery. At first the search for the artery may be somewhat difficult, but, after a number of punctures have been performed, experience makes it rather simple.

Once the subclavian artery has been punctured, a length of rubber tubing is

Fig. 7.—Two seconds after injection. Caliber of lower thyroid artery somewhat larger than normal; vessel tortuous. Some of its branches encircle avascularized area (1 in drawing); others are distributed regularly to some parenchymatous portions of goiter (2 in drawing).

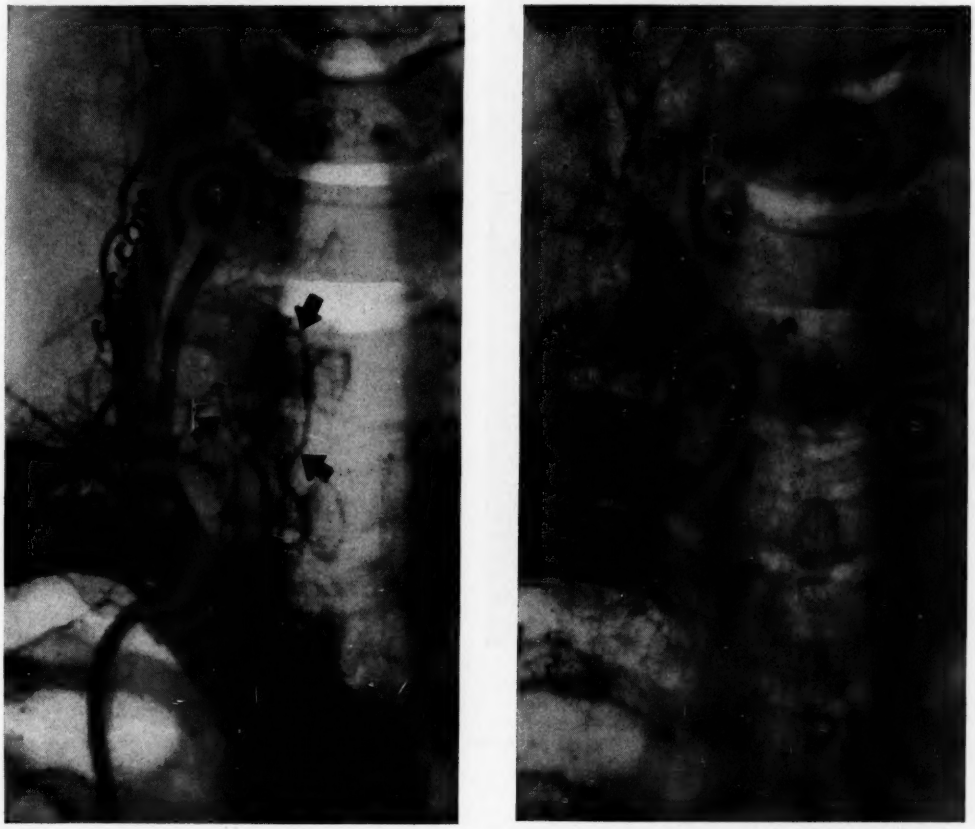


Fig. 8.—*Left*, four seconds after injection. Inferior thyroid artery is small. All its branches are distributed regularly except one, which encircles an avascularized area (arrows). In this case common carotid artery (car. com.) has also been opacified. *Right*, eleven seconds after injection. All thyroid tissue has resumed its transparency, but small area that appeared avascularized is permeated by contrast medium. At operation, lesion proved to be hematic cyst of thyroid.

placed, as an arterial tourniquet, at the root of the arm, and 20 cc. of a contrast medium (Renografin 70 per cent) is injected, at an average speed of about 6 to 7 cc. per second. Starting one second after the beginning of injection, radiograms in the anteroposterior projection are taken at standard intervals of two, three, four, five, seven, nine and twelve seconds. The whole procedure—puncture of the artery and injection of the contrast medium—is not very troublesome to the ordinary patient, apart from some pain that may arise from the incidental stimulation of the brachial plexus, and the sensation of heat in the neck and the head that follows the injection of the contrast into the blood stream; this sensation, however, does not last more than a few seconds and is absolutely tolerable. If the patient is nervous, as many thyreopathic patients are, light barbiturate-gas-oxygen anesthesia makes the task easier.

In effect, the intra-arterial injection of a concentrated contrast medium (70 per cent) often does affect in some measure the functional competence of the vascular bed concerned, with the result that the dy-

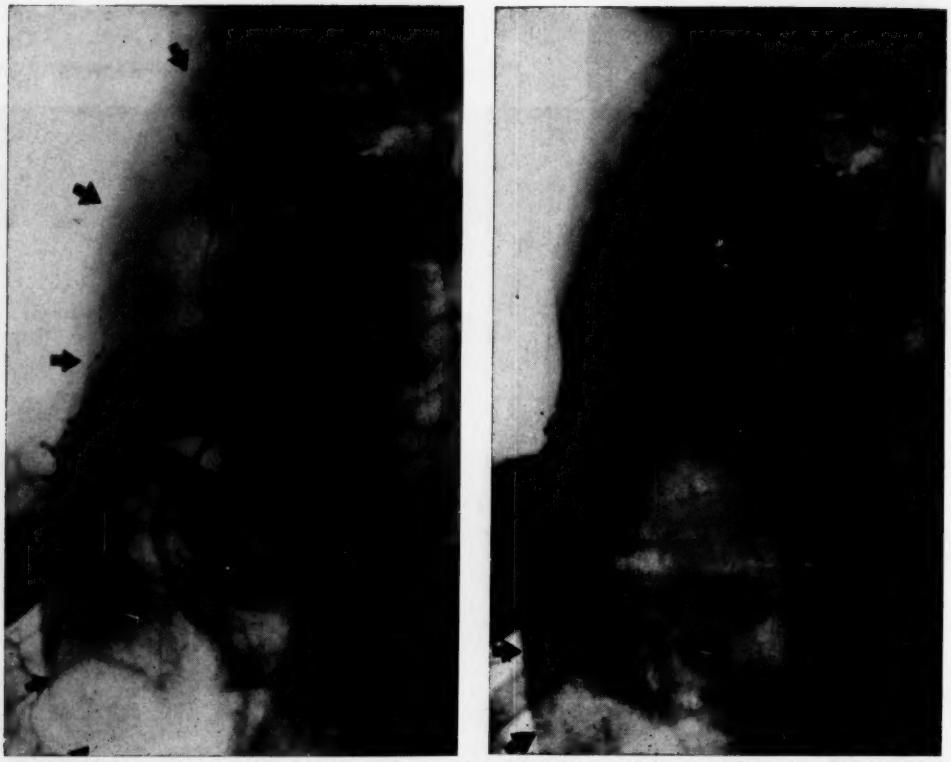


Fig. 9.—*Left,* two seconds after injection. Lower thyroid artery and its branches are shown in environment of large goiter. *Right,* seven seconds after injection. Capillary phase, by outlining entire parenchyma of goiter, shows large avascularized area (arrows) which, at operation, proved to be recently formed hematoma of parenchymatous goiter. This area, a few days earlier, had become suddenly larger, tense and tender.

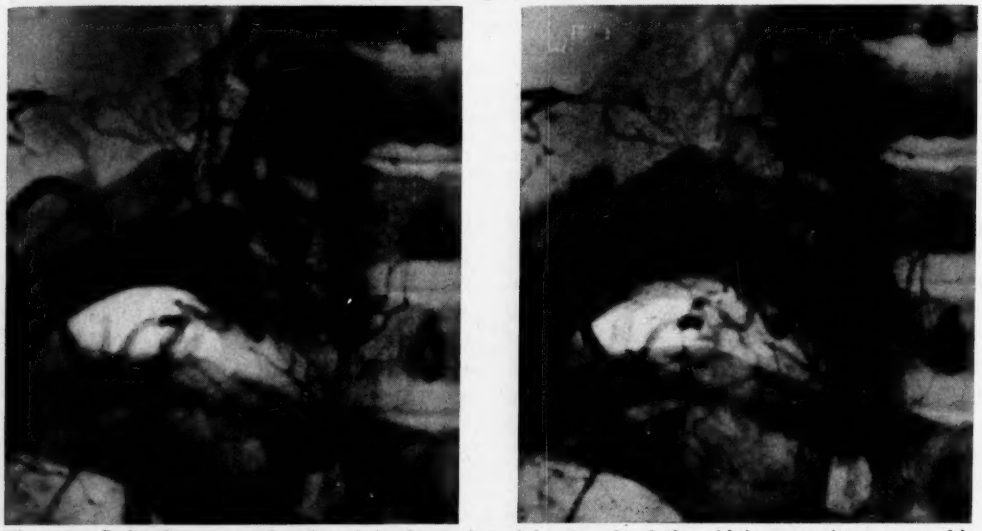


Fig. 10.—*Left,* three seconds after injection. Arterial network of thyroid is poor; its topographic pattern is normal, but contour of vessels is highly irregular. Same features are shown as on left side. *Right,* five seconds after injection. Portion of gland (arrows) is regularly vascularized, in contrast to remainder of thyroid. This observation was confirmed at operation.

namic aspects of the angiographic technic are somewhat upset and the interpretation of the result becomes less reliable. Thus, we prefer now to conduct the arteriographic study on a patient under general anesthesia whenever possible.

In order to get a complete picture of a case, bilateral arteriographic study is done, but simultaneous puncture and injection of the contrast medium are not advisable, for several reasons: (1) the procedure would be made much more difficult; (2) too much contrast medium would be introduced at once for the organism to clear it out safely, and (3) the resulting picture would be less easy to read properly. We prefer, therefore, to obtain the right and the left arteriograms separately, allowing half an hour to elapse between the two parts of the procedure.

Arteriographic study of the thyroid has afforded, in every case, some highly interesting pictures, which recall and illustrate, in an original way, the different aspects of thyroid disease. In many cases, it has also proved extremely useful in differential diagnosis. We shall present the normal thyroid arteriographic picture and a series of the pathologic pictures we consider most significant among those taken in the more than 30 cases we have so far studied by this new method.

The Normal Thyroid Arteriographic Picture.—Injection of a contrast medium

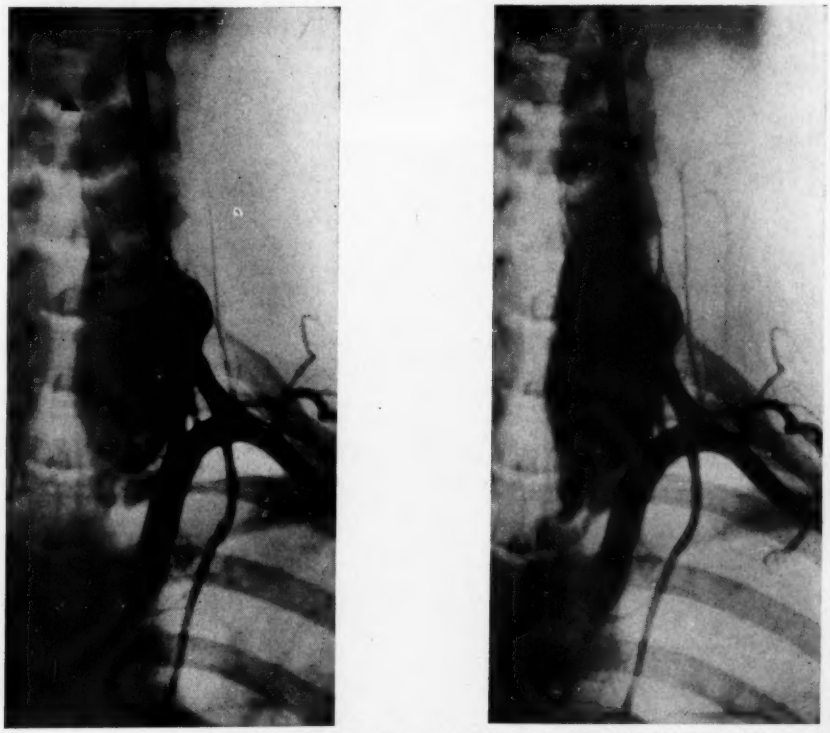


Fig. 11.—*Left,* one second after injection. Lower thyroid artery and all its branches are huge as compared with neighboring arteries (internal mammary, cervicalis ascendens). Particularly dilated is a lower branch (ramus oesophageus) of thyroid artery. *Right,* two seconds after injection. Goiter parenchyma is diffusely stained, so that its lower pole covers large thyroid artery. Middle thyroid veins begin to be outlined. Contour of arterial tree is regular. (*Continued*)

into the subclavian artery, with the application of an arterial tourniquet to the arm, results in sharp outlining of the main arterial branches that originate near the point of subclavian puncture: the vertebral, internal mammary and suprascapular arteries and the truncus thyreocervicalis. The arterial tree that orginates from the inferior thyroid artery branches off to vascularize the most of the hemithyroid concerned and part of the isthmus, as is demonstrated by some angiographic pictures we have obtained in other cases of our series (Figs. 4, 5, 12 and 14).

During the *early arterial phase* (one to two seconds after the injection) the aforementioned arteries are clearly represented and can be easily recognized, together with their main rami (Fig. 3*A*). In the *late arterial phase* (four to five seconds after the injection) the outlines of these arteries can be followed down their thinnest branchings (Fig. 3*B*). From seven to nine seconds after injection of the contrast medium in the normal cases, there occurs the *capillary and early venous phase,* which results in more or less sharp contrast outlining of the parenchyme that depends—for its blood supply—on the aforementioned arteries (Fig. 3*C*). *The late venous phase* is not to be seen in the entirely normal thyroid. It can be seen

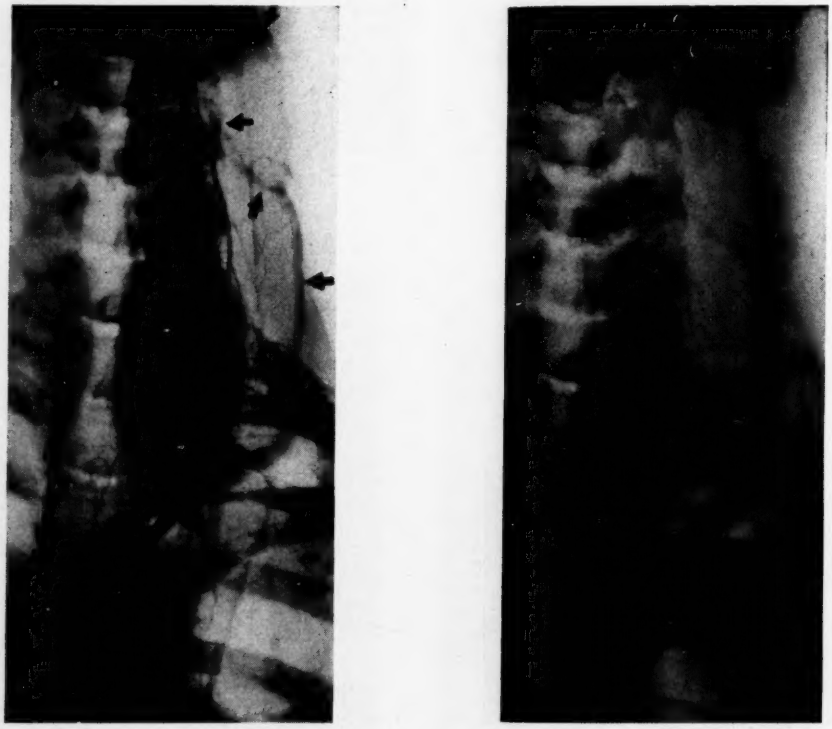


Fig. 11 *(continued).—Left,* four seconds after injection. Main arteries are devoid of contrast medium; parenchyme sharply outlined in its entirety. Venous phase is still more evident; upper and middle thyroid veins to internal and anterior jugular veins; large lower vein to right innominate vein. *Right,* seven seconds after injection. Stain of goiter is fading; internal jugular vein fully outlined.

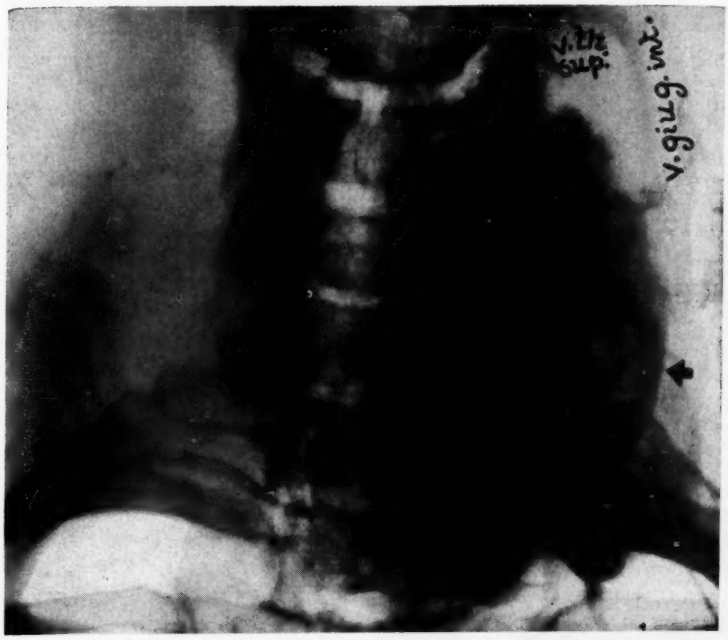


Fig. 12.—Left subclavian arteriograph five seconds after injection. Lower thyroid artery is huge and tortuous; its contour is regular. Left lobe of goiter fully and diffusely outlined; upper thyroid veins also outlined.

Fig. 13. — Right subclavian arteriograph five seconds after injection. Lower thyroid artery large and tortuous. Right lobe and isthmus diffusely stained; right and left thyroid veins simultaneously outlined.

Fig. 14.—Two seconds after injection. Large lower thyroid artery pushed aside by portion of thyroid tissue already directly stained by medium. No venous phase visible within thirteen seconds.

when some pathologic process either quickens the arteriovenous by-passing of the contrast medium (Figs. 11, 12 and 17) or slackens the downflow of the large veins (Fig. 16*A*).

Simple Goiter.—Under this denomination a wide variety of pathological pictures is to be considered, since the disease itself, as Boyd has pointed out, consists of an alternate succession of phases of hyperplasia and involution, each phase leaving behind its traces, with the result that often the whole structure of the thyroid gland is finally completely upset. Even as far as the very vascularization of the thyroid is concerned, however, a number of different aspects exist, which justify the older pathologists' domination of "vascular goiter" on one side and of "struma fibrosa," poorly vascularized, on the other—these being the extremes of a wide range of intermediate conditions. This point in the pathologic morphology of goiter is, of course, the one which the arteriographic technic best demonstrates. Some nonvascular aspects of the disease, moreover, are well illustrated by indirect signs. The *caliber* of the arteries varies, but their profile is always regular, becoming thinner and thinner as they branch toward the peripheral vascular network of the gland. This is an essential feature. Among other advantages, it permits one to differentiate malignant disease of the thyroid from a simple goiter. The *topographic pattern* of vascularization is also highly variable. Aside from the true anatomic varieties, which chiefly concern the origin of the inferior thyroid artery as a proper branch of the subclavian instead of a branch of the truncus thyreocervicalis, the arrangement of the thyroid arterial tree may be rendered irregular by the presence of more richly vascularized parts of the gland or of avascular areas that correspond (at operation) to true cystic or pseudocystic areas (colloidocystic goiter, intraparenchymatous hemorrhage). The *circulatory rate* may be high in cases of vascular goiter (Figs. 1 and 2) and slowed down in cases of fibrous goiter (Fig. 10).

Some different angiographic pictures obtained in cases of simple goiter are shown in Figures 4 to 10 inclusive.

Toxic Goiter.—The 3 cases of goiters we have studied in which some toxic manifestations were present, such as a high metabolic rate, cardiac and gastrointestinal vegetative disturbances, loss of weight, etc., coincide by chance with cases of vas-

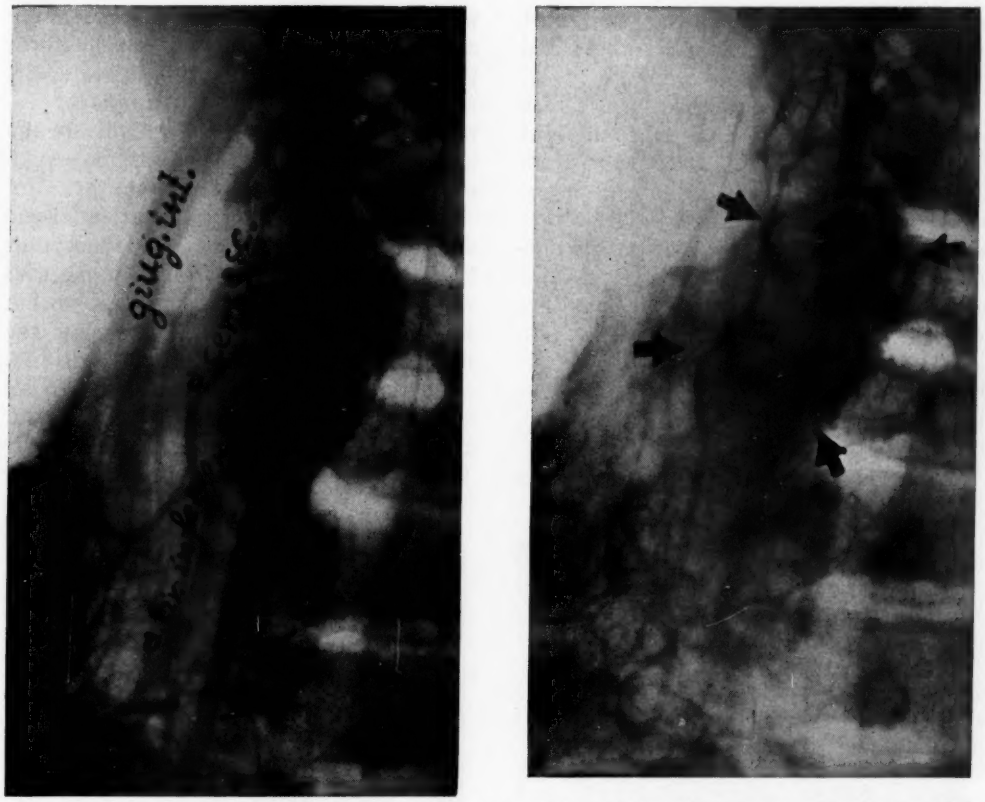


Fig. 15.—*Left*, five seconds after injection. Roundish portion of thyroid tissue is diffusely opacified and pushes aside several branches of lower thyroid artery. Internal jugular vein is outlined. *Right*, seven seconds after injection. Adenoma still intensely opacified.

cular goiter: thus, their angiographic pictures are similar to those in Case 1 and 2, being differentiated only by a constant feature, i.e., a high local circulatory rate. For this reason a very early venous phase is visible in every case whereas in the normal thyroid it is almost never observed and in cases of simple goiters does not appear until seven to nine minutes after injection of the constrast medium.

Apart from the rather obvious physiopathologic considerations that justify this data, the following angiograms (Fig. 11ff.) confirm the observation that injection of the contrast medium through the inferior thyroid arteries does concern approximately the whole thyroid arterial network, as we had hypothesized at the beginning of the study. In effect, the venous drainage often outlined by the contrast medium comprehends the middle and upper thyroid veins, which supply the internal jugular vein (Figs. 12 and 13), while the inferior poles of the gland merely drain toward the anonymous veins through the lowest thyroid venous plexuses (Fig. 11).

Struma Lymphomatosa.—We have observed 1 case which, at biopsy, proved to be a lympho-epithelial hyperplasia of the type known as "struma lymphomatosa." Biopsy had been requested because of

some signs and symptoms that suggested possible malignancy: pain, hardness and fixity to the neighboring structures.

The arteriographic picture in this case was that of a tissue that takes a faint direct staining by the contrast medium from the very first phases of the angiographic study (Fig. 14); the lower thyroid artery is somewhat larger than normal and is pushed aside by an area directly outlined by the contrast medium. The venous phase does not appear within eleven to thirteen seconds.

Some of these features have also been observed in cases of adenoma of the thyroid (Cases 12 and 13).

Adenoma of the Thyroid.—In 2 cases we have studied thyroid adenoma from the angiographic point of view. In 1 of them the adenomatous node was part of a diffuse thyroid swelling, and simple hyperplasia and cysts were also present. In the other case there was a solitary adenoma of the right lobe of the thyroid.

In both cases the adenomatous tissue showed a typical angiographic aspect; that is, an intense direct staining by the contrast medium in the early phases, so that it became sharply outlined among the neighboring thyroid tissue, which is regularly vascularized. The venous phase appears between five and nine seconds after injection (Figs. 15 and 16), according to the circulatory rate, which is different for

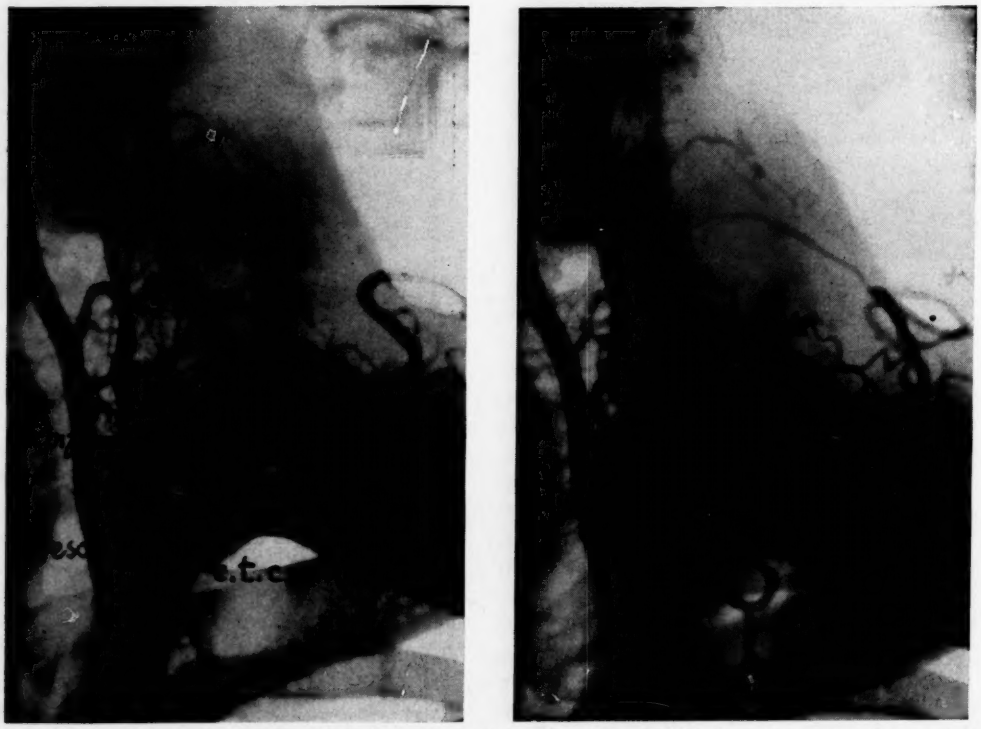


Fig. 16.—*Left*, two seconds after injection. Lower thyroid artery and its branches, as well as some neighboring arteries, including suprascapularis (s.sc) pushed aside by portion of thyroid tissue that seems, at this stage, scarcely vascularized (t.t.c., truncus thyreocervicalis; ces. br., esophageal branches of lower thyroid artery). *Right*, four seconds after injection. Arrows point to "avascularized" area, which is now diffusely stained by contrast medium. (*Continued*)

the adenomatous tissue and for the surrounding tissue.

Carcinoma of the Thyroid.—Figure 17 shows the typical arteriographic picture of carcinoma of the thyroid. The outline of a large lower thyroid artery is suddenly and sharply interrupted at the level of the tumor; here it gives origin to a number of very thin vessels, forming a thick network, whose caliber and anastomosing pattern are absolutely irregular. Because of the peculiar morphologic and dynamic aspects of tumor circulation the neoplastic tissue itself is diffusely stained by the contrast medium, thus standing out among the neighboring tissues.

Moreover, from the very first phase of the angiographic procedure, when the contrast medium is still outlining the large arteries of the neighboring tissues, the veins to which the blood drainage of the tumor is committed are intensely stained. The combining of these angiographic signs (sudden interruption of the arterial profile, irregularity of the vascular network, direct staining of the tumors, early outlining of veins) which have been recognized as unquestionable signs of malignancy in angiographic study of other areas, are also present with carcinoma of the thyroid. This has proved very useful in differentiating the condition in this case and those in, say, Cases 6, 7 and 11 of the present series, in which, from a clinical point of view, there were some signs of malignancy. In cases of more advanced involvement, of course, the subclavian artery itself can be infiltrated and interrupted, whereas some of the thyroid tissue can be vascularized by some muscular arteries of the shoulders.

Fig. 16 *(continued).*—Nine seconds after injection. Jugular vein, intensely outlined by contrast medium, is compressed at level of previously stained adenomatous area (arrows).

CONCLUSIONS

In the authors' opinion, the data obtainable by angiographic study are significant and reliable. The cases they collected illustrate many aspects of thyroid disease, although not all of them. For instance, they have not obtained, so far, any angiographic representation of goiter of the posterior mediastinum, where is would have a double significance, indicating (1) whether the growth belongs actually to the thyroid and (2) whence and how it is getting its blood supply. From these observations, together with those concerning the intrinsic nature of the growth, may largely depend the choice of a surgical approach, i.e., whether it ought to be a cervical, a thoracic or a combined approach.

In the authors' opinion, because of the variety of angiographic pictures already collected, a first evaluation of the method of study can be made now. Particularly

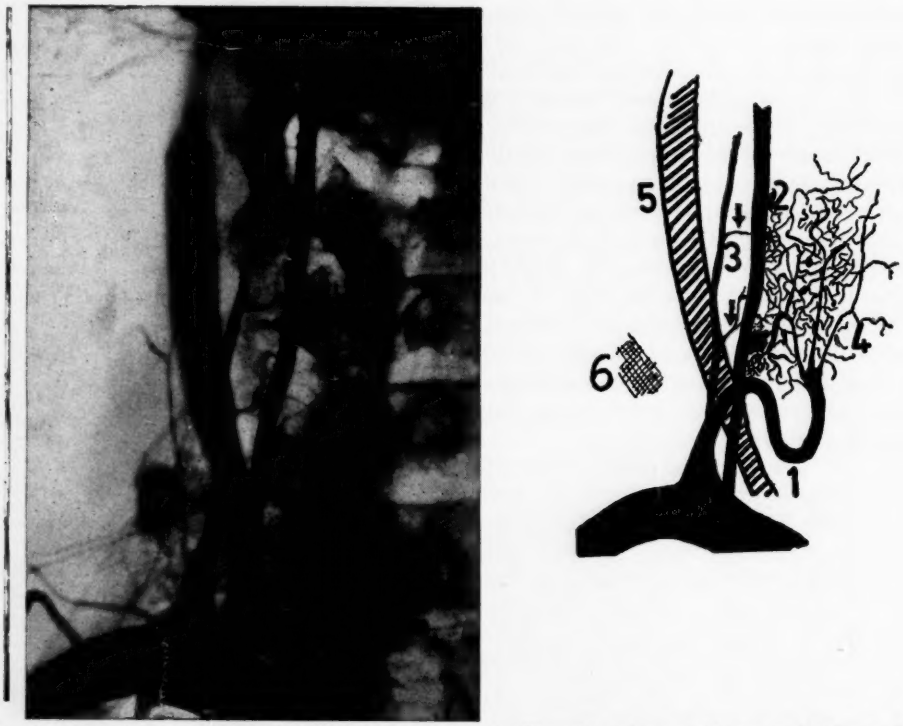


Fig. 17.—Carcinoma of thyroid (early arterial phase). Thyroid artery suddenly and sharply interrupted, giving rise to several very thin vessels forming an irregular network (4); tumor diffusely stained. Jugular vein (5) intensely stained only three seconds after injection. Calcification is present (6).

interesting appears the possibility of differentiating carcinoma of the thyroid from other diseases which, from a clinical standpoint, may suggest malignancy but which, on the other hand, may benefit from nonsurgical therapy (e. g., Hashimoto's disease). Also interesting are the functional data obtainable in cases of toxic goiter: they join the results of other clinical and laboratory methods aimed at ascertaining both the diagnosis and the effectiveness of the medical therapy. For these and other reasons, angiographic study of the thyroid by means of subclavian puncture can be defined as an easy and efficient method of clinical study. The authors hope it will be more widely applied to the diagnosis of certain diseases of this gland.

CONCLUSIONI

Gli Autori danno molta importanza agli studi angiografici nelle malattie della tiroide. La loro documentazione ne illustra molti aspetti, ma non tutti—in quanto mancano rappresentazioni angiografiche del gozzo del mediastino posteriore. Tali rappresentazioni potrebbero essere utili (1) per decide re se la massa appartiene o no alla tiroide e (2) per identificarne i rapporti vascolari. Questi due elementi assieme al riconoscimento della natura del tumore sono indispensabili per la scelta del tipo di intervento chirurgico. Nonostante la grande varietà di angiogrammi da essi ottenuti, gli Autori credono di poter fare una prima valutazione critica

del metodo. Particolarmente interessante è la possibilità di differenziare il carcinoma della tiroide da altre malattie della stessa ghiandola che clinicamente possono simulare la malignità ma dal punto di vista terapeutico possono essere trattate conservativamente: la malattia di Hashimoto, per esempio.

Pure interessanti sono i dati funzionali, specie nei gozzi tossici, che il metodo può fornire; tanto che esso può affiancarsi agli altri mezzi clinici e di laboratorio per accertare sia la diagnosi che l'efficacia della terapia medica.

Per queste ed altre ragioni, lo studio angiografico della tiroide mediante puntura della succlavia può essere definito un facile ed efficace metodo di studio, sicchè gli Autori sperano che esso possa essere più largamente impiegato nella diagnosi di certi stati patologici di questa ghiandola.

CONCLUSIONS

L'étude angiographique procure des données importantes et sûres. Les cas réunis par les auteurs illustrent plusieurs aspects de l'affection thyroïdienne. Mais ils n'ont, par exemple, obtenu encore aucune représentation angiographique des goîtres de la région postérieure du médiastin, qui devrait permettre: 1) d'indiquer si la tumeur est vraiment d'origine thyroïdienne; 2) de préciser le point de départ de son apport sanguin. C'est de cex données, ajoutées à celles concernant la nature de la tumeur, que dépend en grande partie le choix de la voie d'accès opératoire.

Les auteurs sont cependant convaincus de la possibilité d'une première évaluation de la méthode, grâce à la variété des angiogrammes qu'ils ont pu réunir. Un point important à son actif est ou'elle permet le diagnostic différentiel entre le carcinome de la thyroïde et d'autres affections suggérant un état malin, mais qui peuvent aujourd'hui bénéficier d'une thérapeutique non chirurgicale (maladie de Hashimoto). L'angiographie donne également des renseignements fonctionnels intéressants sur le goître toxique. Ajoutée à d'autres études cliniques et de laboratoire elle permet un diagnostic précis et une thérapeutique efficace.

Pour toutes ces raisons, et pour d'autres encore non mentionées ici, l'étude angiographie de la thyroïde par ponction sous-claviculaire peut être définie comme une méthode clinique simple et sûre. Les auteurs expriment le voeu d'une plus grande généralisation de son emploi dans le diagnostic de certaines affections de la thyroïde.

CONCLUSIONES

Según la opinión de los autores los datos suministrados por los estudios angiográficos son significativos y dignos de confianza. Los casos recogidos ilustran muchos aspectos de la enfermedad tiroidea, aunque no todos. Por ejemplo, no han logrado ninguna representación angiográfica de los bocios del mediastino posterior lo que hubiera tenido una doble significación: 1) indicarías si la tumoración pertenece o no al tiroides, y 2) hubieran capacitado al investigador para asegurarse del origen de la irrigación sanguínea. De estos datos, mas los referentes a la naturaleza del tumor, depende en gran parte la elección de la vía quirúrgica.

Sin embargo, partiendo de la variedad de angiogramas ya obtenidos estan convencidos los autores de que se puede hacer una evaluación primaria del método. Particularmente interesante es la posibilidad de diferenciar el carcinoma del tiroides de otras enfermedades que, desde el punto de vista clínico, pudieran hacer pensar en malignidad pero que son capaces de mejorar por métodos no quirúrgicos, cual ocurre, por ejemplo, en la enfermedad de Hashimoto. Tambien son interesantes los datos funcionales proporcionados por este método de investigación en relación con los bocios tóxicos. El procedimiento debe

emplearse en conjunto con los otros estudios clínicos de laboratorio para asegurar el diagnóstico correcto y la eficacia de la terapéutica médica.

Por estas y otras razones el estudio angiográfico del tiroides por invección subclavia como un método de estudio fácil y efectivo. Los autores confían en que ha de ser más ampliamente utilizado en el diagnóstico de ciertas enfermedades del tiroides.

SCHLUSSFOLGERUNGEN

Die Verfasser halten die von ihnen mit angiographischen Untersuchungen gewonnenen Informationen für bedeutsam und für zuverlässig. Die von ihnen gesammelten Fälle veranschaulichen viele wenn auch nicht alle Aspekte der Schilddrüsenerkrankungen. Es ist ihnen bisher nicht gelungen, angiographische Darstellungen von Kröpfen im hinteren Mediastinum zu erzielen. Gerade diese würden von zweifacher Wichtigkeit sein, weil sie erstens nachweisen würden, ob die Geschwulst wirklich von der Schilddrüse ausgeht oder nicht, und zweitens dem Untersucher die Quelle ihrer Blutversorgung aufdecken würden. Von diesen Kenntnissen und von Informationen über die Art der Geschwulst würde die Wahl des chirurgischen Zugangsweges in hohem Masse abhängen.

Nichtsdestoweniger sind die Verfasser überzeugt, dass die Vielfältigkeit der von ihnen bisher gesammelten Angiogramme eine erstmalige Auswertung des Verfahrens rechtfertigt. Besonders interessant ist die Möglichkeit, den Schilddrüsenkrebs von anderen Erkrankungen zu unterscheiden, die zwar vom klinischen Standpunkt eine bösartige Erkrankung vermuten lassen, tatsächlich aber einer nicht chirurgischen Behandlung zugänglich sind wie z.B. die Struma lymphomatosa (Hashimoto). Auch die beim toxischen Kropf mit dieser Methode erhältlichen Funktionswerte sind von Interesse. Das Verfahren kann anderen klinischen Untersuchungen und Laboratoriumstesten angereiht werden, die für die Diagnostik und für die Beurteilung der Wirksamkeit medizinischer Behandlung zur Verfügung stehen.

Aus diesen und anderen Gründen kann die angiographische Untersuchung der Schilddrüse durch Einspritzung eines Kontrastmittels in die A. subclavia als ein leicht ausführbares und wertvolles klinisches Untersuchungsverfahren erklärt werden. Die Verfasser hoffen, dass die Methode eine umfangreichere Anwendung in der Diagnostik gewisser Schilddrüsenerkrankungen finden wird.

CONCLUSOES

Na opinião dos autores os dados obtidos com estudos angiográficos são signicantes e conclusivos. Os casos por êles coletados ilustram muitos aspectos das doenças da glândula tireoide, ainda que não tôdas. Por exemplo, até agora ainda não obtiveram nenhuma representação angiográfica de bócios localizados no mediastino posterior, área em que estas representações teriam um duplo significado: 1. elas indicariam se o tumor pertence ou não à glândula tireoide e 2. possibilitariam ao investigador determinar a origem dos seus vasos sanguineos. Baseado nêstes dados mais aqueles relacionados com a origem do tumor vai depender em grande parte a escolha do acesso cirúrgico ao tumor. Entretanto devido a variedade de angiogramas já coligidos os autores estão convencidos que uma avaliação preliminar do método é possível. Particularmente interessante é a possibilidade de diferenciar o carcinoma da tireoide de outras enfermidades que do ponto de vista clínico sugerem malignidade e que naturalmente beneficiam-se de uma terapêutica não cirúrgica, por exemplo a enfermidade de Hashimoto.

Também interessante são os dados funcionais que se podem obter com êste tipo de estudo nos casos de bócio tóxico. O processo pode ser adicionado a outros estudos clínicos e de laboratório visando diagnóstico correto e terapêutica médica efetiva.

Por estas e outras razões o estudo angiográfico da glândula tireoide por meio da punctura subclávia pode ser definido como método fácil e efetivo de estudo clínico. Os autores esperam que o método seja empregado com mais freqüência no diagnóstico de certas enfermidades da glândula tireoide.

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Those who assert that the human body is a single substance seem to have reasoned along the following lines. Having observed that when men died from excessive purgation following the administration of drugs, some vomited bile and some phlegm, they concluded from this that whatever was the nature of the material voided at death, this was indeed the fundamental constituent of man. Those who insist that blood is the basic substance use a similar argument; because they see blood flowing from the body in the fatally wounded, they conclude that blood constitutes the soul. They all use similar arguments to support their theories. But, to begin with, no one ever yet died from excessive purgation and brought up only bile; taking medicine which causes the bringing up of bile, produces first the vomiting of bile, but subsequently, the vomiting of phlegm as well. This is followed by the vomiting of black bile in spite of themselves and they end up by vomiting pure blood and that is how they died.

—*Hippocrates*

Editorials

Congressional Record Comments on the International College of Surgeons

AN address by the Hon. Lister Hill, United States Senator from Alabama, "The International College of Surgeons and the Health of Our People," was entered in the permanent archives of the nation as of Thursday, June 4, 1959. We are deeply gratified by this public recognition of our College and its value to our country, and no less so by the emphasis placed therein on the scope of our effective service as a world scientific organization. A program based on such ideals as those of the International College of Surgeons, with their constant stress on world-wide freedom of communication, learning and action among surgeons and scientists, stands out in bold relief against the hazards that threaten humanity's progress today.

The address was first delivered at a meeting of the Alabama Section of the College at Huntsville, Alabama, on May 21. We are sure that not only those fortunate enough to have been present at this meeting but every Fellow of the College and every reader of the *Journal* will wish to have access to Senator Hill's fine pronouncement. Accordingly, we reproduce the full text below:

"At the entrance to the International Surgeons' Hall of Fame in Chicago there is a symbolic statue called Hope and Help. This statue depicts a suffering patient whose eyes look upward into the comforting face of the surgeon.

"From time immemorial, my friends, you doctors have played the key role in the alleviation of human suffering. Yours has been the truly international art, for as the great Louis Pasteur wrote, 'Science does not belong to any country, because knowledge is a patrimony of humanity.'

"The history of surgery is shining evidence of the truth of Pasteur's dictum. Medical historians date the first document on surgery, known as the Edwin Smith papyrus, to I-Em-Hotep, the earliest recorded physician of ancient Egypt. The germination of surgery then followed a cosmopolitan trail through Hippocrates, Galenus, and Ambroise Pare to Andreas Vesalius, the father of the study of anatomy who from the gallows took corpses of executed criminals that he might study them.

"Early surgery was decidedly on the rough side. In fact, in ancient and medieval times most of the cutting was done by barbers, butchers, dentists, stonecutters and herniotomists. Through most of the history of mankind, the surgeon has had to work under almost unbearable handicaps; he had to perform without an effective anesthetic, and with no knowledge of asepsis and antisepsis. Preoperative and postoperative care were virtually unknown.

"The modern age of surgery really began with the work of William Harvey, an Englishman, who in 1628 published his findings that the heart pumped the blood continually in the body. Harvey was one of the great research scientists of all times —his animal studies over a 20-year period

laid the groundwork for modern physiology. A generation later, the Italian Morgagni made many great contributions to the nature of disease, including the discovery that tuberculosis is a contagious disease.

"The 19th century laid the precise groundwork for the miracles of 20th century surgery. It was in the 19th century that the Hungarian Semmelweis pioneered in the use of antiseptic methods in childbirth. A Frenchman, Louis Pasteur, after proving that germs cause disease, developed a process to kill them. Joseph Lister, whose honored name I am privileged to bear, one of the greatest surgeons in medical history, applied the basic ideas of Pasteur to surgery. His use of antiseptics in surgery revolutionized operating procedures. My father studied under Joseph Lister in England and much of what he learned from him prepared him for that eventful night—more than 50 years ago—when on a kitchen table in a Negro shack right here in Alabama, by the flickering light of two kerosene lamps, he performed the first successful suture of the human heart in America.

"It is but fair to state that the 20th century has witnessed a golden age of surgery. In 1903 a Dutchman, Willem Einthoven, with his newly developed electrocardiograph first recorded the electrical impulses in the heart. The years since have brought nothing short of miraculous techniques in surgery. In 1939 Dr. Robert E. Gross repaired the first congenital heart defect to yield to surgery. In 1945 Drs. Alfred Blalock and Helen B. Taussig developed their famous blue baby operation to correct a combination of congenital heart defects which robbed the blood of oxygen and the tissues of nourishment. This blue baby operation has been demonstrated in all parts of the world, it has saved the lives of thousands of children.

"It is impossible to summarize in a few moments the staggering advances of the past decade. In 1949, for the first time in the history of mankind, a surgeon, Dr. Charles Bailey, performed an operation inside the heart. Today open-heart surgery is almost a commonplace, and surgeons now remove the aorta, the main artery leading out of the heart, and replace it with a plastic substitute.

"The International College of Surgeons, founded in Geneva a quarter of a century ago, has played a major role in many of the exciting surgical and medical developments of recent years. Your guiding principle, 'Science has no fatherland,' is exemplified in the fact that your 13,000 members represent 64 countries. Your general surgical congresses bring together outstanding medical minds and knowledge from all parts of the world. Your international postgraduate surgical clinics, which are held in a score of countries each year, bring the latest surgical techniques to your medical brethren around the globe.

"In a truly international spirit of dedication, you have shipped supplies, instruments, sutures, material, gloves and drugs to impoverished countries whose surgical centers are most desperately in need of this vital equipment. You sponsor research grants to deserving scientists, and you give fellowships to surgeons desirous of improving their art through postgraduate study.

"As you establish new chapters of the college in various parts of the world, you lift the standards of surgical practice, you bring the gift of extended life to many areas of the world where the Biblical three score and 10 years of life is still an unattainable goal. What this means, for example, to the struggling surgeons of Asia, far removed from large medical centers and struggling with staggering problems of infectious diseases which have been wiped out in the West, is told most movingly in the words of Dr. Muhammad S. Quereshi at the organization meeting of the Pakistan Chapter of the International College of Surgeons in 1952:

'The establishment of this chapter will enable us to render twofold service to our country: it will place Pakistan at once on the international map of surgery, and will greatly help in the improvement of our surgical standards which means better service to Pakistan nationals. . . . The college brings about wide, frequent and intimate contacts with the leading exponents of our art. Such contacts with men who have devoted their lives to the solution of surgical problems and have made lasting contributions to our profession are undoubtedly a source of great inspiration and will stimulate us to emulate them.'

"The late Dr. Elmer Henderson, that gifted and distinguished son of Kentucky who held the presidency of both the American Medical Association and the World Medical Association, probably best summed up your impact when in 1951 in his farewell address as president of the American Medical Association he said:

'The work of the World Medical Association and of the World Health Organization and that of other groups, such as the International College of Surgeons, has assumed importance far beyond the field of medicine. By serving as forums for the exchange of ideas between men and women of vastly different backgrounds and environments, they initiate a realization of brotherhood that seems beyond the best efforts of diplomacy. Medicine's high role in world affairs is firmly rooted in the very nature of its own work.'

"In this second half of the 20th century, America holds an increasingly solid position as the medical fountainhead of the world. Reversing the trend of the 18th and 19th centuries, the trek is now westward across the Atlantic to the United States to keep abreast of the latest developments in the art and science of medicine and surgery.

"In a world which modern communication and transportation make smaller each day, we become increasingly aware of the plight of our fellow men in many parts of the world. At the turn of the century the great physician Sir William Osler wrote, 'Humanity has but three great enemies: fever, famine, and war; of these by far the greatest, by far the most terrible, is fever.' His words still ring true. We are aware of the fact that an underprivileged two-thirds of the human race is constantly afflicted by the ravages of disease. Millions of these people suffer from the age-old scourges of malaria, tuberculosis, and the various intestinal infections. In many countries of the world a third of the babies die during the first year of life, and life expectancy falls 30 and 40 years short of the Biblical three score and ten.

"At present we are engaged in an effort to stop the spread of Communist imperialism, which is competing with us for the uncommitted peoples of the world. Communism finds a ready breeding place in the ill health and poverty of the submerged peoples of the world. Communist forces of militant medicine are on the march. We have reports that Russia is sending about 2,000 doctors a year to do medical missionary work in these underdeveloped areas.

"Yet we who once fired the shot 'heard 'round the world,' and gave a new dimension to personal liberty in the founding of a Republic which guaranteed life, liberty, and the pursuit of happiness to all of its citizens, have been slow to meet this challenge.

'In the closing days of the 85th Congress, I introduced a bill which would provide the mechanism through which this country would join with all the countries of the world in a united medical research offensive against the major killers and cripplers of mankind. The bill would create, as part of the National Institutes of Health, a National Institute of International Health and Medical Research. This institute would be charged with the support of worthy medical research proj-

ects submitted by competent investigators from any part of the world. It would support the training of specialized research personnel here and abroad, it would encourage and support the rapid international exchange of research knowledge concerning disease and disability.

"In introducing this bill on the Senate floor, I pointed out that the unfinished tasks facing medical research are truly staggering. For example, cancer, that most ancient enemy of man, is rising in its incidence in 33 countries of the world. What more priceless bounty could be given to the suffering peoples of the world than a cure for this universal and dread disease?

"In the current session of the Congress, 63 Senators joined me in sponsoring this legislation. I am happy to say that on yesterday the Senate passed the bill by a vote of 63 to 17. During the last week in February of this year, hearings were held on this International Medical Research Act, and I think I may state that it received unprecedented and overwhelming support from doctors, scientists, voluntary health organizations, and civic leaders.

"Testifying on behalf of the American Medical Association, its president, Dr. Gunnar Gundersen, told our Senate committee of a growing recognition that medicine with its resources and influence fully mobilized can perhaps do more for world peace than the billions of dollars being poured into armaments. Mr. John T. Connor, the president of one of the largest pharmaceutical companies in America, told the committee that 'the International Medical Research Act stirs the imagination with its opportunities for a new breakthrough in international relations as well as in medical research.'

"Dr. I. S. Ravdin, the distinguished surgeon who is currently serving as vice president for medical development of the University of Pennsylvania, told us that 'we who have gained so much from the research of our own scientists and those from other countries, where good research has been done and is being done, must realize that the more quickly we can assist those less fortunate to begin to achieve what we have so fortunately achieved, the more quickly universal understanding will be won in our troubled world.'

"Dr. Ross T. McIntire, who serves you so capably as excutive director of the International College of Surgeons, strongly endorsed the bill in a very fine presentation before our committee. Following his testimony, Dr. McIntire wrote me that 'the International College of Surgeons is so organized that the program that you are proposing in the International Medical Research Act would be a natural, in that we have outstanding men in foreign lands who are in teaching institutions and who are presently engaged in forms of research.'

"In Chicago you have built the International Surgeons' Hall of Fame which does honor to those great men of all faiths and of all nations who have made immortal contributions to the art and science of surgery. On the day that the hall of fame was dedicated, Dr. Max Thorek, the father of the International College of Surgeons, pronounced these words, which truly epitomize the universality of all surgery:

'We shall honor these men, but not so much as they will honor us. As Agesilaus truly remarked, it is not the places that grace men, but men the places. We are but paying another installment of our age-long debt to those who cleared the way for us, a debt to which we can never write "paid in full." '

"Let me say that the International Medical Research Act is not only a payment on our debt to the physicians and surgeons of all nations but an affirmation of the ideals which motivate the International College of Surgeons. It states our belief that disease is a universal threat to the family of man, and that we must unite our medi-

cal research efforts to wipe out this threat. It accepts the fact that no nation has a monopoly on medical research, and that our own self-interest dictates a maximum effort toward the rapid pooling of the fruits of such research. It accepts the fact that we must raise a common banner under which the doctors and scientists of all lands can march to the goal of better health for all mankind.

"Inspired by your devotion to the health of our people, by your courage, your faith, and your generous works for humanity, and moved by the high ideals and purposes of your International College of Surgeons, we shall press forward into the ever-widening horizons of medical discovery and medical knowledge. In the confidence of knowledge, in the strength of integrity, in the tenderness of sympathy, in the fellowship of humility, and in the love of God we shall continue to wage together the never-ending battle for the health of our people, for the health of all peoples, and for peace on this earth."

—M. T.

The ancients, who were chiefly guided in their medical notions by the simple operations of nature, attached great importance to the influence of the moon. . . . Lucilius, the Roman satirist, says that oysters and echini fatten during lunar augmentation; which also, according to Gellius, enlarges the eyes of cats: but that onions throw out their buds in the decrease of the moon, and wither in her increase, an unnatural vegetation, which induced the people of Pelusium to avoid their use. Horace also notices the superiority of shell-fish in the increase.

Pliny not only recognizes this influence on shell-fish, but observes, that the streaks on the livers of rats answer to the days of the moon's age; and that ants never work at the time of any change: he also informs us that the fourth day of the moon determines the prevalent wind of the month, and confirms the opinion of Aristotle that earthquakes generally happen about the new moon. The same philosopher maintains that the moon corrupts all slain carcasses she shines upon; occasions drowsiness and stupor when one sleeps under her beams, which thaw ice and enlarge all things; he further contends, that the moon is nourished by rivers, as the sun is fed by the sea.

In more modern times the same wonderful phenomena have been attributed to this planet. The celebrated Ambroise Paré observed, that people were more subject to the plague at the full. Lord Bacon partook of the notions of the ancients, and he tells us that the moon draws forth heat, induces putrefaction, increases moisture, and excites the motion of the spirits; and, what was singular, this great man invariably fell into a syncope during a lunar eclipse.

—*Milligen, circa 1839*

Surgical Thought and Practice in Ancient Greece and Rome

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BOSTON, MASSACHUSETTS

A KNOWLEDGE of Greek and Roman surgery is an indispensable tool for the educated physician who would understand the spirit and pattern of modern surgery. I propose to consider briefly some aspects of the practice and thought of Greek and Roman surgery by references, primarily, to the *ipsissima verba* of Hippocrates, Celsus, Soranus and Paulus. Even as late as the fourteenth century the physicians who were most frequently quoted and who exercised a dominant influence upon medical practice were Hippocrates, Soranus, Celsus and Paulus. This emphasizes the fact that ancient knowledge of surgery had never fully congealed; rather, its methods of procedure flowed into modern times.

Why, one may ask, were their contributions so significant? Among the many reasons that can be cited are the following four basic, fertile ideas: first, a reliance on reason to explain man's structure and his illness; second, a belief that there is a natural as well as a supernatural cause of disease, which meant, in effect, a shift of emphasis from a *Gottsanschauung* to a *Weltanschauung;* third, the development of a spirit of inquiry that led to an objective accumulation of facts, and fourth, an intellectual capacity to formulate principles as guides to practical procedures. Here indeed are the beginnings of a "Fifth Estate"! These factors seem all the more significant now when one remembers that surgery in ancient times was an art practiced alike by physicians proper, by priests, by philosophers and by gymnasiarchs.

It will be profitable to glance at maps showing the culture of Greece about 500

During the forthcoming months of 1959 and as long thereafter as possible, the editorial pages of the Journal of the International College of Surgeons *will be honored by presentations of rare and extraordinary historic value, the lectures presented at the International Surgeons' Hall of Fame on medical and surgical history from the earliest recorded achievements to those of our own times. We believe that* Journal *readers who were not able to attend the lectures will find them as exciting as did the audiences present at their delivery. The story of progress in the healing arts and the giants of medicine and surgery to whom we owe the amazing brilliance and scope of modern achievement is intrinsically thrilling and is a vital part of the education of every cultivated man and woman, inside or outside the profession. It is altogether fitting that it should appear in these pages, since the International College of Surgeons is first, last and always a teaching institution.*

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B.C. and during the Hellenistic period *(Fig. 1)*.[1] Note the location of the following cities in the Mediterranean littoral area, which properly bear upon the present discussion: *Croton* (the home of Alcmaeon, the first anatomist to influence the course of Greek thought); *Agrigentum* (here Empedocles announced his concept that matter is composed of four elements); *Miletus* and *Cos* (in these cities Thales and Hippocrates respectively used reason to replace superstition, in large measure, in the explanation of natural phenomena); *Chalcedon* and *Chios* (made famous by the great Alexandrian School of Anatomists, Herophilus and Erasistratus); *Pergamon* (the birthplace of Galen, a most arresting figure in scientific medicine); *Alexandria* (the site of the great Museum and University — where the scientific method of science was initiated) and, finally, *Aegina* (associated with the name of Paulus, the best representative of Greek surgery prior to the revival of letters).

These maps show how contact among different peoples and the blending of their cultures become a main source of scientific progress.[2] For example, a dissemination of Greek culture occurred during the eighth and seventh centuries B.C. through a mass migration into Sicily, southern Italy (Magna Graecia), Spain, Cyprus, Egypt, Asia Minor and Persia. The conquests of Alexander the Great, whose armies carried the Greek language to the East, had a broadening cultural effect, as is attested by the fact that the work of many Greek authors was translated from Syriac into Arabic by the Nestorian Syrians. Among the earliest of these translations were those of the writings of Hippocrates, Galen, Oribasius and Paulus. Paulus was not only the first of the Greek medical authors to be translated into Arabic but he remained for many centuries the chief authority of Arabian surgery.

The spirit that motivated the Greco-Roman seekers of scientific truth may be illustrated by a legend made familiar by Rudyard Kipling[3]: "Once upon a time, perhaps at the birth of Time, the Gods took unto themselves the problem of Man's claim to divinity. Having conceded Man's claim, the legend goes that the Gods stole away this godhead of divinity and hid it where Man should never again find it. If they hid it anywhere on Earth, the Gods foresaw that Man, the inveterate hunter, would leave no stone unturned till he had recovered it. If they concealed it among themselves, they feared that Man might in the end batter his way even to the skies. And while they were thus at a stand, the wisest of the Gods closed his hand upon this tiny unstable light of Man's stolen godhead and hid it where Man would never dream of looking for it . . . inside Man himself."

The development of Greco-Roman science passed through the following periods: (a) the Hellenic, from its origin to the conquests of Alexander, 650-300 B.C., exemplified by Hippocrates; (b) the Alexandrian, from the dynasty of the Ptolemies, circa 300 B.C., until the first century of the Christian era, exemplified by Herophilus and Erasistratus, and (c) the Greco-Roman, from the Christian era to the middle of the sixth century A.D., exemplified by Celsus, Galen, Soranus and Paulus. From the point of view of medical education,[4] a physician of the Hippocratic period was a craftsman, who used a techne akin to that of a carpenter, a bard, a soothsayer or a herald. Later, a broader interpretation was given to the term "physician," for Aristotle[5] refers to three kinds of physicians: first the apothecary, then the physician of a higher class, and third, the intelligent man who has studied the art. In the latter category one would place the intelligent, nonprofessional medical amateur Celsus. The first official Roman school of medicine was established about the year 14, and as other

Fig. 1.—Map indicating background of Greek culture about 500 B.C. and during Hellenistic period.

schools came into being the teaching of physicians achieved the status of a profession. Bilingualism was a most important tool: Greek was the language of science and philosophy—Latin, the language of law and administration.

Although medicine was at no time sectarian, several sects existed with sharply contrasting views. The attitude, for example, of the Dogmatists, Empiricists, Methodists and Eclectics toward dissection of the human body played an important part in the progress of medicine. Edelstein[6] points out that, during the fifth and fourth centuries B.C., physicians dissected dead and living animals and transferred the knowledge so gained from animals to man. This analogic method of learning was predicated on the belief of an all-embracing uniformity in nature. From the third century B.C., the Dogmatists contended that dissection of the human body is essential. The Methodists disclaimed this point of view while the Empiricists took a middle-of-the-road position and argued that, although human anatomy is important, knowledge of it may be acquired by chance. At Alexandria the study of human anatomy was pursued with great earnestness and scientific perception by Herophilus and Erasistratus. The detailed observations made by these investigators did not, however, influence vitally the prevalent practice of surgery. The surgeons were not interested in obtaining detailed knowledge of major internal organs; on the contrary, their efforts were devoted toward developing and skillfully using various kinds of instruments for amputation, the treatment of fractures and dislocations and the couching of cataracts.

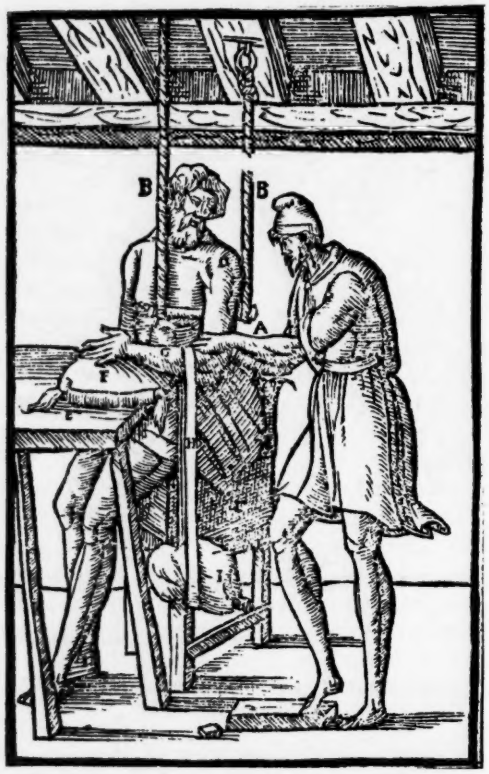

Fig. 2.—Fracture of the humerus treated by the Hippocration method.

HIPPOCRATES OF COS (*circa 460-357*)[7].—The Hippocratic treatises on fractures and on dislocations are masterly presentations and became the classics of the doctor in Rome. They exhibit evidence of first principles of inductive research and practice, procedures that may, even now, be followed with advantage. The general surgery of the time remained unsurpassed until the nineteenth century. The descriptions are clear and concise. The principle of *vis medicatrix naturae* operates in all cases; there is no language suggestive of supernatural forces. The *ipsissima verba* here reported will deal with fracture of the humerus; diagnostic signs and treatment of dislocation of the shoulder; fracture of the clavicle; first aid; dislocation of the jaw, and injuries of the cranium.

Fracture of the Humerus[8] *(Fig. 2):* "When the humerus is fractured, it follows that the most correct mode of extension of the arm is this:—One should hang up a rod, in shape like a spade handle and of a cubit in length or rather shorter, by a cord at each end. Seat the patient on a high stool and pass his arm over the rod so that it comes evenly under the armpit in such a position that the man can hardly sit and is almost suspended. Then placing another stool, put one or more leather cushions under the forearm as may suit its elevation when flexed at a right angle. The best plan is to pass some broad scarf around the arm and suspend from it heavy weights sufficient for due extension; failing this, let a strong man grasp the arm in this position at the elbow and force it downwards. As to the surgeon, he should operate standing with one foot on some elevated support, adjusting the bone with the palms of his hands. The adjustment will be easy, for there is extension if it is properly managed."

Dislocation of the Shoulder[9] *(Fig. 3):* "When, then, the humerus is displaced into the axilla, many know how to reduce it since it is a common accident, but expertness includes knowledge of all the methods by which practitioners effect reduction, and the best way of using these methods. You should use the most powerful one when you see the strongest need, and the method that will be described last is the most powerful.

"Those who attempt to put in the shoulder with the heel, operate in a way nearly conformable with nature. The patient should lie on his back on the ground, and the operator should sit on the ground on whichever side the joint is dislocated. Then grasping the injured arm with both hands he should make extension and exert counter-pressure by putting the heel in the armpit, using the right heel for the

right armpit, and the left for the left. In the hollow of the armpit one should put something round fitted to it,—the very small and hard balls such as are commonly sewn up from bits of leather are most suitable. For, unless something of the kind is inserted, the heel cannot reach the head of the humerus, for when extension is made on the arm the axilla becomes hollow and the tendons on either side of it form an obstacle by their contraction. Someone should be seated on the other side of the patient undergoing extension to fix the sound shoulder so that his body is not drawn round when the injured arm is pulled the other way. Take, besides, a fairly broad strap of soft leather, and after the ball is put into the armpit, the strap being put round and fixing it, someone, seated at the head of the patient undergoing traction, should make counter-extension by holding the ends of the strap, and pressing his foot against the top of the shoulder-blade. The ball should be put as far into the armpit and as near the ribs as possible, not under the head of the humerus."[11]

Appollonius' Comment on Dislocation of the Shoulder[10] *(Fig. 4):* "There is another mode of reduction in which they put it right by a shoulder lift: but he who does the shoulder lift must be the taller. Grasping the patient's arm, let the operator put the point of his own shoulder under his armpit, then make a turn that it may get seated there, the aim of the manoeuvre being to suspend the patient from his shoulder by the armpit. He should hold this shoulder higher than the other, and press in the arm of the suspended patient towards his own chest. In this attitude let him proceed to shake the patient when he lifts him up, so that the rest of the body may act as a counterpoise to the arm which is held down. If the patient is very light, a boy of small weight should

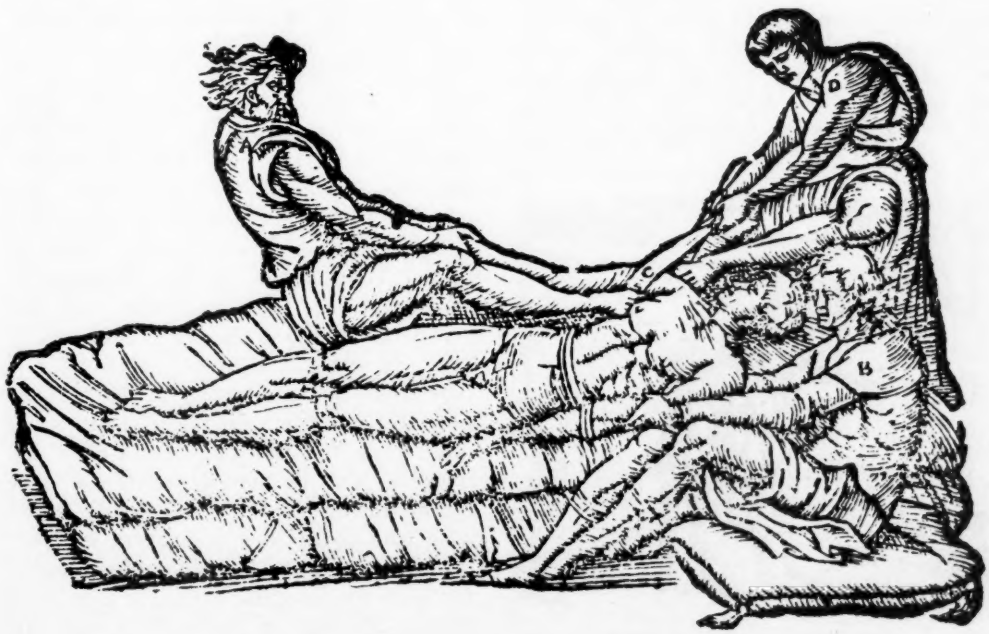

Fig. 3.—Dislocation of the shoulder treated by the Hippocration method.

be suspended to him from behind. All these methods are very useful in the palaestra, since they do not require further bringing in of apparatus, and one might also use them elsewhere."

Signs of a Dislocation of the Humerus[10, 11]: First, since men's bodies are symmetrical as to arms and legs, one should use the sound in comparison with the unsound, and the unsound with the sound; not observing other people's joints (for some have more projecting joints than others), but those of the patient himself, to see if the sound one is dissimilar to the one affected. And though this is correct advice there is a good deal of fallacy about it. This is why it is not enough to know the art in theory only, but by familiar practice. For many persons, owing to pain or some other cause, though their joints are not dislocated, cannot hold themselves in the attitude which the healthy body assumes. One must, therefore, take this also into consideration and have such a position in mind. Now, first, the head of the humerus is much more obvious in the armpit on the injured than on the sound side. Again, towards the top of the shoulder the part appears hollow, while the bone at the shoulder-point (acromion) is seen to project, since the articular end of the humerus has sunk to the lower part of the region. Yet there is some fallacy in this too, but it will be described later, for it merits description. Again, the elbow of the dislocated limb obviously stands out more from the ribs than that of the other. If, indeed, one should forcibly adduct it, it yields, but with much pain. Further, the patient is quite unable to raise the arm straight alongside the ear, with the elbow extended, as he does with the sound one, or move it about in the same way. These, then, are the signs of a dislocated shoulder, the modes of reduction are the ones described, and these the methods of treatment."[11]

Fig. 4.—Appollonius' method of treating dislocation of the shoulder.

Fractured Clavicle[12]: "BUT The following should also be borne in mind, namely, that the clavicle as a rule is so fractured that the part arising from the breast-bone is on the top and that from the shoulder-point (acromion) below. The reason of this is as follows: the breast-bone does not move much either downwards or upwards, for the range of the joint at the sternum is slight and there is continuous connection between the breast-bone and the spine, but the clavicle on the side of its connection with the shoulder is especially loose, for it has to have great freedom of movement owing to the acromial junction. Besides, when it is fractured, the part adherent to the breast-bone flies upwards, and can hardly be pressed down, for it is naturally light and there is a larger vacancy for it above than below. But the shoulder, upper arm and parts annexed are easily separated from the ribs and breast-bone and therefore can be moved through a large space upwards and downwards. Thus, when the collar-bone is broken, the part towards the shoulder sinks downwards, for with the shoulder and arm it is more readily disposed to move down than upwards. So whenever this state of things

occurs, they are unintelligent who think it possible to press the projecting part of the bone downwards; while it is obvious that one must bring the lower part up, for this is the moveable part, and this too is the one out of its natural place. It is obvious then that other methods are useless in reducing this fracture—for bandagings are no more likely to bring the parts together than to separate them—but if one presses the arm upwards as much as possible, keeping it to the side, so that the shoulder appears very pointed, it is clear that the fragment will thus be brought into connection with the bone arising from the sternum from which it was torn."[11]

First Aid [13]: "What you should put first in all the practice of our art is how to make the patient well; and if he can be made well in many ways, one should choose the least troublesome. This is more honourable and more in accord with the art for anyone who is not covetous of the false coin of popular advertisement. To return to our subject—there are certain homely means of making extension, such as might readily be found among things at hand. First, supposing no soft supple leather holdfasts are available, one might still wrap up iron chains, ship's tackle, or cords, in scarves, or torn woollen rags, especially at the part where they are fastened on, and somewhat further, and then proceed to bind them on as holdfasts. Again, one should use a bed, the strongest and largest available, for making good extension; the legs of the bed either at the head or foot should press against the threshold, outside or inside, as is opportune, and a quadrangular plank should be laid crosswise against the other legs, reaching from one to the other. If the plank is thin, let it be fastened to the legs of the bed; but if thick, this is unnecessary. Next, one should tie the ends of the bands, both those at the head and those at the feet respectively, to a pestle, or some other such piece of wood. Let the bands be in line with the body, or slanting a little upwards, and evenly stretched to the pestles."

Dislocation of Lower Jaw[14] *(Fig. 5)*: "The jaw is rarely dislocated, but often makes a side-slip in yawning, a thing which changes of position in muscles and tendons also often produce. When dislocation occurs, the following are the most obvious signs: the lower jaw is thrown forward and deviates to the side opposite the dislocation; the coronoid process appears more projecting on the upper jaw, and patients bring the jaws together with difficulty.

"The appropriate mode of reduction in these cases is obvious. Someone should hold the patient's head, while the operator grasping the jaw with his fingers inside and out near the chin—the patient keeping it open as wide as he conveniently can—should move the jaw this way and that with his hand, and bid the patient keep it relaxed and assist the movement by yielding to it as far as possible. Then suddenly do a side-slip, having in mind three positions in the manoeuvre. For the deviation must be reduced to the natural direction, the jaw must be pressed backwards, and following this, the patient must close his jaws and not gape. This, then, is the reduction, and it will not succeed with other manoeuvres. A short treatment will suffice. Apply a compress with cerate and a loose bandage over it. The safest way of operating is with the patient recumbent."

Injuries of the Cranium[15] (See accompanying figure for scheme of cranial sutures according to Hippocrates,[16] *Fig. 6)*: The following quotations point up the extraordinary insight of Hippocratic surgeons in dealing with the neurosurgical conditions of simple fracture, contusion

without fracture, depressed fractures, indentations in the outer table and contre coup fractures accompanied by contralateral signs and symptoms. One finds reasonable advice on the dressing of wounds, trepanization and general medical care."

a. *Sutures of the Head:* "Men's heads are not alike nor are the sutures of the head disposed the same way in all. When a man has a prominence in the front of his head—the prominence is a rounded outstanding projection of the bone itself—his sutures are disposed in the head as the letter *tau* (T), is written; for he has the shorter line disposed transversely at the base of the prominence; while he has the other line longitudinally disposed through the middle of the head right to the neck. But when a man has the prominence at the back of his head, the sutures in his case have a disposition the reverse of the former, for while the short line is disposed transversely at the prominence, the longer is disposed through the middle of the head longitudinally right to the forehead. He who has a prominence at each end of his head, both front and back, has the sutures disposed in the way the letter *eta* (H), is written, for the long lines have a transverse disposition at either prominence and the short goes through the middle of the head longitudinally, ending each way at the long lines. He who has no prominence at either end has the sutures of his head as the letter *chi* (X), is written: the lines are disposed one transversely coming down to the temple, the other longitudinally through the middle of the head."

b. *Fracture with Depression:* "The bone is contused and depressed inwards from its natural position with fractures, for otherwise it would not be depressed. For the depressed bone, broken off and fractured, is crushed inwards away from the rest of the bone, which keeps its place; and of course there will thus be a fracture as well as a contused depression. This is a third mode."

3. *Fracture "Par Coutre-Coup":* "The skull is wounded in a part of the head other than that in which the patient has the lesion and the bone is denuded of flesh. This is a fifth mode. When this accident occurs, you can do nothing to help; for if the man has suffered this injury, there is no possible way of examining him to make sure that he has suffered it, or whereabouts in the head it is."

d. *Rules of Physical Examination:* "The first thing to look for in the wounded man is whereabouts in the head the wound is, whether in the stronger or weaker part, and to examine the hair about the lesion, whether it has been cut through by the weapon and gone into the wound. If this is so, declare that it is likely that the bone is denuded of flesh and injured in some way by the weapon. One should say this at first inspection, without touching the patient . . . And you should also ask the wounded man how he suffered the injury, and of what kind it was . . . further, that the man suffered vertigo and loss of sight, was stunned and fell down . . . Most cases have spasm of the parts on one side of the body; if the patient has the lesion on the left side of the head, spasm seizes the right side of the body; if he has the lesion on the right side of the head, spasm seizes the left side of the body. Some also become apoplectic and die in this state within seven days in summer and fourteen in winter. These symptoms have the same value both in an older and a younger patient."

e. *Deceptive Anatomy:* "For the sutures themselves, having a fracture-like appearance, and being more uneven than the rest of the skull, deceive the mind and eye of the physician, when not violently cleft or gaping—cleft and hedra are the same."

CELSUS, AULUS CORNELIUS *(fl. 50 B.C.-17 A.D.)*[16]—Celcus was the Roman author of

a masterly compilation entitled *Artes*, the medical part of which is a fundamental source for the history of Alexandrian medicine and the greatest work of antiquity after those of Hippocrates and Galen. Empiricism, Methodism, theory and practice characterize this important work. The *De re Medicina*,[17] the earliest medical book in Latin (approximately A.D. 30), was lost during the Middle Ages and rediscovered and printed as early as 1478, and its influence during the Renaissance was very great. The *ipsissima verba* here will be concerned with wounds; ligatures; amputation; ruptured blood vessel within the skull; catheterization; vesical calculus; pterygium; referred pain and lithotomy.

Wounds[18]*:* "In this connection, however, a practitioner should know above all which wounds are incurable, which may be cured with difficulty, and which more readily. For it is the part of a prudent man first not to touch a case he cannot save, and not to risk the appearance of having killed one whose lot is but to die; next, when there is grave fear without, however, absolute despair, to point out to the patient's relatives that hope is surrounded by difficulty, for then if the art is overcome by the malady, he will not appear to have been ignorant or mistaken. But while such steps become a prudent practitioner, it is like a mountebank to exaggerate a small matter in order to enhance his own achievement. It is right to commit himself to a statement that a case is simple in order that he may examine it with even more care for fear a case slight in itself may become worse by negligence on the doctor's part."

Ligatures[19]*:* "If we are afraid of haemorrhage which can be judged both from the position and size of the wound and from the force of the flowing blood, the wound is to be filled with dry lint, and over that a sponge applied, squeezed out

Fig. 5.—Treatment of dislocation of the lower jaw.

of cold water, and pressed down by the hand. If the bleeding is not checked thus, the lint must be changed several times, and if it is not effective when dry, it is soaked in vinegar. Vinegar is powerful in suppressing a flow of blood; and some, therefore, pour it into wounds . . . But if even these are powerless against the profuse bleeding, the blood vessels which are pouring out blood are to be seized, and round the wounded spot they are to be tied in two places and cut across between so that the two ends coalesce each on itself and yet have their orifices closed. When circumstances do not even admit of this, the blood vessels can be burnt with a red-hot iron."

Amputation[20] ("When gangrene has developed"): "Therefore between the SOUND and the DISEASED part, the flesh is to be cut through with a scalpel down to bone, but this must not be done actually over a joint, and it is better that some of the sound part should be cut away than that any of the Diseased part should be left behind.

When the bone is reached, the sound flesh is drawn back from the bone and undercut from around it, so that in that part also some bone is bared; the bone is then to be cut through with a small saw as near as possible to the said flesh which still adheres to it; next, the face of the bone, which the saw has roughened, is smoothed down, and the skin drawn over it; this must be sufficiently loosened in an operation of this sort to cover the bone all over as completely as possible." [*Note* (by Spencer): The amputation described by Celsus was often used in the war of 1914-1918 for stumps that had become pointed after emergency amputations.]

Ruptured Blood Vessel within the Skull[21]: "Therefore, after a blow on the head first we must enquire whether the patient has had bilious vomiting, whether there has been obscurity of vision, whether he has become speechless, whether he has had bleeding from the nose or ears, whether he fell to the ground, whether he has lain senseless as if asleep; for such signs do not occur unless with fractured bone. If in addition there is also stupor, if the mind wanders, if either paralysis or spasm has followed, it is probable that the cerebral membrane has also

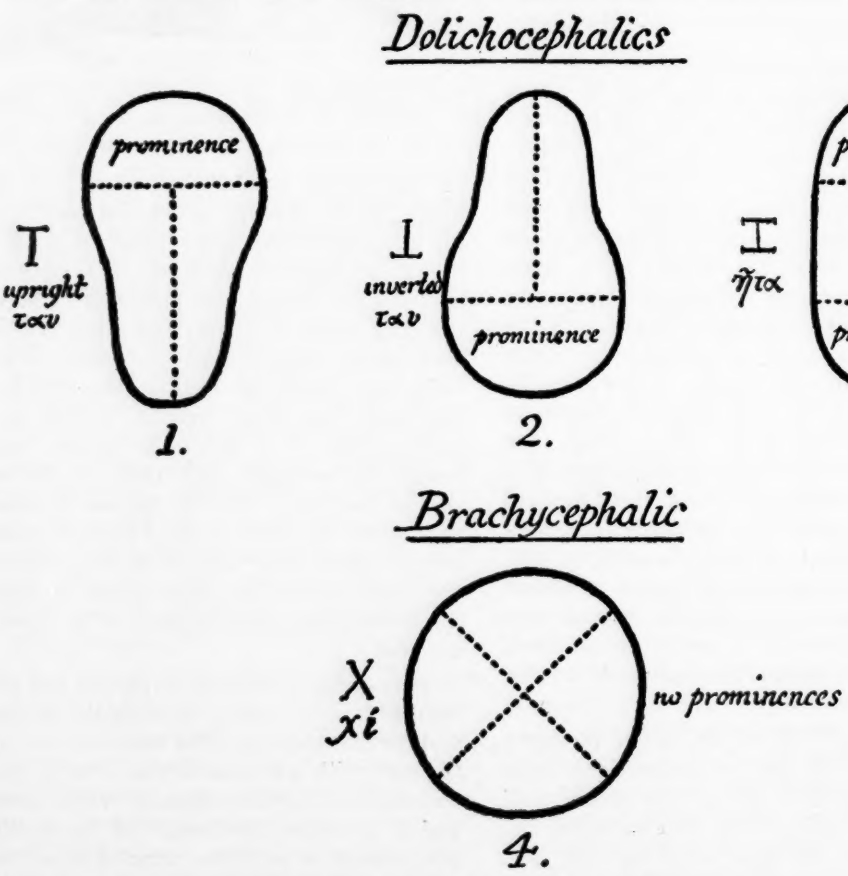

Fig. 6.—Hippocratic schema of cranial sutures.

been lacerated . . . Rarely, but now and then, it happens that whilst the bone remains whole and sound, yet within the skull a blood vessel in the cerebral membrane has been ruptured by the blow and some blood has escaped, and this having formed a clot, causes great pains or sometimes obscures vision."

Catherization[22]*:* "Sometimes we are compelled to draw off the urine by hand when it is not passed naturally; either because in an old man the passage has collapsed, or because a stone, or a blood-clot of some sort has formed an obstruction within it; but even a slight inflammation often prevents natural evacuation; and this treatment is needed not only for men but sometimes also for women. For this purpose bronze tubes are made, and the surgeon must have three ready for males and two for females, in order that they may be suitable for everybody, large and small: those for males should be the longest, fifteen finger-breadths in length, the medium twelve, the shortest nine; for females, the longer nine, the shorter six. They ought to be a little curved, but more so for men, and they should be very smooth and neither too large nor too small. Then the man must be placed on his back, in the way described for anal treatment, on a low seat or couch; while the practitioner stands on his right side, and taking the penis of the male patient in his left hand, with his right hand passes the pipe into the urethra; and when it has reached the neck of the bladder the pipe, together with the penis, is inclined and pushed on right into the bladder; and when the urine has been evacuated, it is taken out again. The woman's urethra is both shorter and straighter, like a nipple placed between the inner labia over the vagina, and this requires assistance no less often though it is attended by somewhat less difficulty. Sometimes too a stone slips into the urethra itself, and lodges not far from its orifice, because this becomes narrower further down. The stone should if possible be extracted either by an earscoop or by the instrument with which a stone is drawn out in the course of lithotomy."

Calculus in the Bladder[23]*:* "Then the surgeon having carefully pared his nails and anointed his left hand, gently introduces two fingers, the index and the middle, first one and then the other, into the anus; next he places the fingers of his right hand upon the hypogastrium but lightly, lest if the two sets of fingers should press around the calculus with any force, the bladder may be injured. It may be inferred that the stone is at the neck of the bladder when the patient has difficulty in passing water: or that the stone is spinous when he passes bloody urine in drops. The stone is first sought about the neck of the bladder; when found there, it is expelled with less trouble. If not at the neck, or if it has slipped back, the fingers are placed against the base of the bladder while the surgeon's right hand too is placed above the stone and gradually follows it downwards."

Pterygium[24]*:* "Pterygium, in Greek, is a little fibrous membrane, springing from the angle of the eye, which sometimes even spreads so as to block the pupil. Most often it arises from the side of the nose, but sometimes from the temporal angle . . . Thereupon, the surgeon passes a sharp hook, the point of which has been a little incurved, under the edge of the pterygium and fixes the hook in it; next, leaving that eyelid also to the assistant, he draws the hook towards himself thus lifting up the pterygium, and passes through it a needle carrying a thread; then having detached the needle, he takes hold of the two ends of the thread, and raises up the pterygium by means of the thread; he now separates any part of it which adheres to the eyeball

by the handle of the scalpel until the angle is reached; next by alternately pulling and slackening the thread, he is able to discover the beginning of the pterygium and the end of the angle."

Referred Pain[25]*:* "Further, a disease of another of the viscera, the liver, is also sometimes chronic, sometimes acute: the Greeks call it hepaticon. There is severe pain in the right part under the praecordia, which spreads to the right side, to the clavicle and arm of that side; at times there is also pain in the right hand, there is hot shivering."

The Crushing of Stone[26]*:* "If, however, at any time the stone appears too large to extract without tearing the neck of the bladder, it is to be split up; hence Ammonius the inventor of this process was surnamed lithotomus. This is done as follows: the scoop is passed over the stone, so that it easily keeps hold of the stone, even when it is struck; next an instrument is used of moderate thickness, its front end tapering yet blunt, and when this is put against the calculus, and its other end struck, it splits up the stone, great care being taken that the instrument does not come into contact with the bladder itself, and that no fragment from the broken calculus cuts into it."

SORANUS OF EPHESUS *(fl. 98-138).*—Soranus was a Greek anatomist and physician, the greatest gynecologist of antiquity, nicknamed "Methodicorum princeps."[27] He made use of the speculum, of the obstetric chair and of instruments to make injections into the uterus. The *ipsissima verba* will concern the naming and description of the uterus; difficult labor, and embryotomy.

a. *Nature of the Uterus*[28] *(Fig. 7):* "The uterus *(metra)* is also termed *hystera* and *delphys.* It is termed *metra* because it is the mother of all embryos born of it or because it makes mothers of those who possess it; or, according to some people, because it possesses a metre of time in regard to menstruation and childbirth. And it is termed *hystera* because afterwards it yields up its products, or because it lies after all the entrails, if not precisely, at least broadly speaking. And it is termed *delphys* because it is able to procreate brothers and sisters.

"The uterus is situated in the large space between the hips, between the bladder and the rectum, lying above the rectum and sometimes completely, sometimes partly, beneath the bladder, because of the variable size of the uterus.

"By thin membranes the uterus is connected above with the bladder, below with the rectum, laterally and posteriorly with excrescences of the hips and the os sacrum. When these membranes are contracted by an inflammation, the uterus is drawn up and bent to the side, but when they are weakened and relaxed, the uterus prolapses.

"The shape of the uterus: it is not curved as in dumb animals, but similar to a cupping vessel. For beginning with a rounded and broad end at the fundus, it is drawn together proportionally into a narrow orifice. The first and outermost part of the uterus has been called 'orifice,' the next part 'neck,' and the following part 'isthmus,' and the totality of these parts has been called 'tube.' And after the narrowness of the 'neck,' the first parts of the uterus broadening on both sides are called 'shoulders,' the next 'sides' and the remotest part 'fundus.' The underlying part is called the 'base' and the whole space 'cavity' or 'hollow' or 'sinus.'

"Preeminently, the whole uterus is a sinewy structure. For it is composed not of nerves only, but also of veins, arteries, and flesh. Of these, the nerves take their origin from the membrane of the spinal cord, whereas the arteries and veins originate from the vena cava which lies along

the spinal column and from the thick artery."

b. *Difficult Labor:* "In cases of difficult labor, the physician should also question the midwife. (Now whether) it is caused by constriction and contraction of the region through which the fetus is to travel, or by coldness or heat of the atmosphere, or by hardness of the body, or because of a concavity of the loins, or a naturally small uterus, or because of conceiving too early in life, or because of the burden of fat, or because of compressing tumors, or grief, or fear, or bending of the neck, or inflammation or dryness, or whatever other cause, one should first promote ease and relaxation. And one should neither have immediate recourse to surgery nor allow the midwife long to dilate the uterus forcibly. Now if difficult labor takes place because the parturient has concave loins, one should place her upon her knees so that the uterus may fall toward the abdominal wall and come to lie in a straight line with its neck.

"If the closed part has been opened by... means of softening and greasy substances, one should also straighten the neck of it if it is bent. One should push aside a tumor with ointment if it lies close by. If not, one should cut it out surgically whether it be a warty excrescence, or a calloused swelling, or a dividing membrane, or a growth of flesh, or any other such obstacle. If the excreta have been kept back, one should get rid of the faeces by introducing an enema of water mixed with oil or hydromel, while the urine should be removed by means of the catheter if the bladder is full of urine. If a wedged-in stone is the cause, one must push the stone with the catheter out of the neck of the bladder and drive it back into the cavity. One should carefully cut through with the lancet a chorion that does not open, having first made a depression at some place with the finger. If, however, the fluid has already drained forth, one should instill some greasy fluid into the vagina by means of a small syringe.

"If the fetus is situated abnormally, one must make the position normal. If in a cephalic presentation the fetus lies out of position, one should introduce the anointed left hand, the nails being pared so that they may not scratch, and the fingers extended, joined together at their tips to give them a tapering shape so that they may be introduced without causing laceration. The hand should be inserted when the orifice of the uterus widens naturally, in order that this may not take place when it closes and contracts, creating a firm resistance. Having grasped the fetus, one should bring it into a straight line with the orifice of the uterus, assisting the change by making the parturient lie in the respective positions. For the patient must be placed on the opposite side: on the right side in those cases where the fetus is deviated to the left, but on the left side if the fetus has wandered to the right. She should lie back in a sloping position if the fetus has deviated forward as if against the abdominal wall, but should kneel forward with her face lowermost if the embryo has deviated inward as if against the loins. If, however, deviation is combined with impaction, one should first push up and lift the fetus, so that it is removed from the orifice of the uterus, and so straighten it."

c. *Embryotomy:* "If the fetus does not respond to manual traction, because of its size, or death, or impaction in any manner whatsoever, one must proceed to the more forceful methods, those of extraction by hooks and embryotomy. For even if one loses the infant, it is still necessary to take care of the mother. Therefore, one should warn of the underlying danger of supervening fevers, sympathetic nervous troubles, sometimes even of excessive inflam-

mation, and that there is little hope particularly if gangrene appears; in the latter case, there is weakening, profuse perspiration, chills, imperceptible pulse, sharp fever, delirium and convulsions."

PAUL OF AEGINA[29] *(fl. A.D. 625-690).*— Paul of Aegina was the most important physician of his day and a skilled surgeon. He was the latest representative of Greek medicine before the Muslim supremacy. His medical encyclopedia, in seven books,[29] was largely based on Galen and Oribasius. His writings had great influence upon Arabic literature. They first appeared from the famous Aldine press in Venice in 1528. The *ipsissima verba* will deal with hypospadias,—catheterism and intestinal hernia.

On Hypospadias[30]*:* "In many children the glans is not perforated at birth, but the meatus is situated under the part called canis, at the termination of the glans. Hence they can neither make water forwards unless they draw up the member to the pubes, nor procreate, as the semen cannot be injected direct into the uterus. In addition to these defects, the complaint occasions no ordinary deformity. Wherefore, the simplest and least dangerous mode of operation is that by amputation. Having then placed the patient in a supine position, we have to stretch the glans forcibly with the fingers of the left hand, and then with the point of a scalpel we are to amputate the glans at the corona, not making the amputation obliquely, but carving it, as it were, all round, so that an eminence may appear in the middle resembling the glans. And since a hemorrhage frequently takes place, we may stop it by styptics if possible, but if not, we

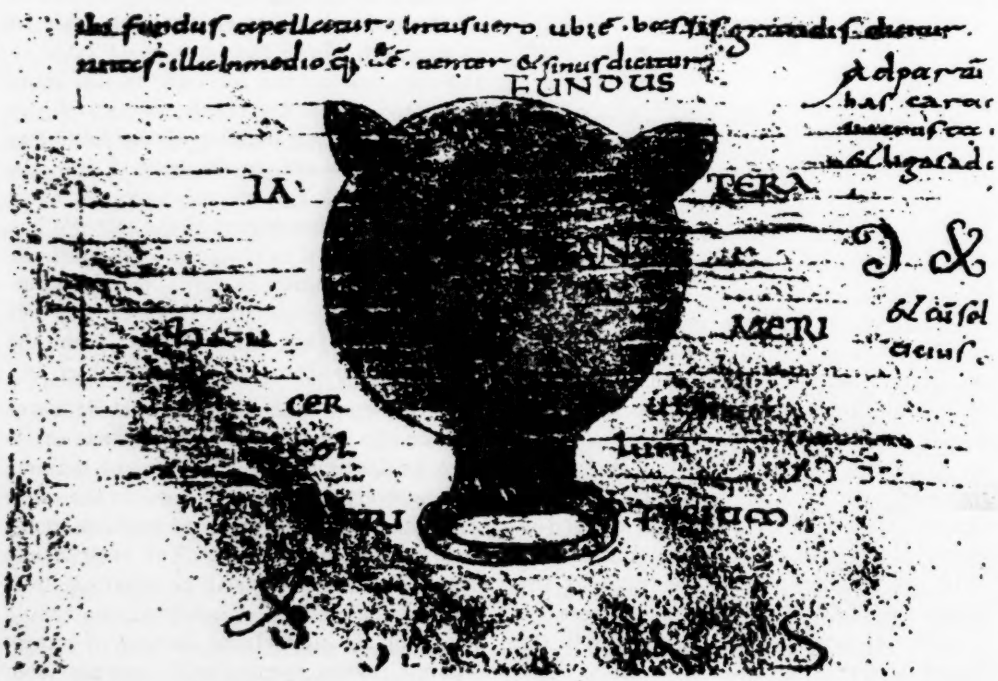

Fig. 7.—The uterus as described by Soranus of Ephesus.

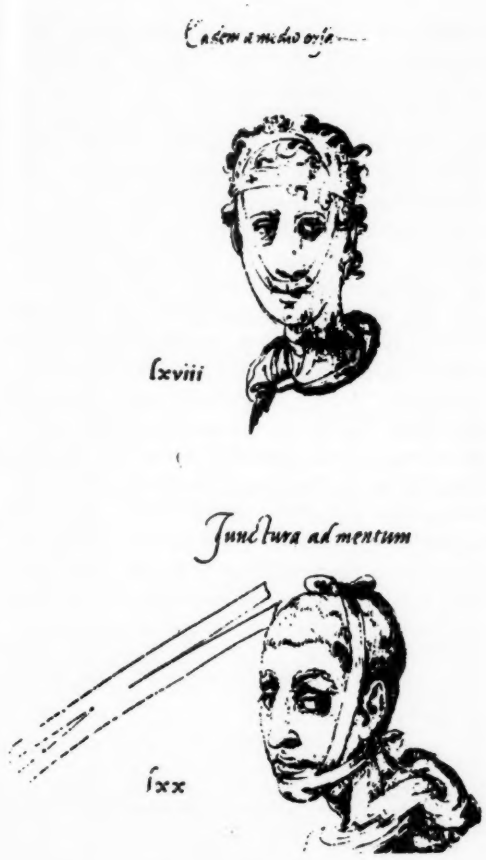

Fig. 8.—Examples of bandaging.

must have recourse to burning with slender cauteries."

Catheterization[31]*:* "When the urine is suppressed in the bladder, owing to some obstruction, such as a coagulum, or stones, or from any other cause, we have recourse to catheterism for the removal of it. Wherefore, taking a catheter proportionate to the age and sex we prepare the instrument for use. The mode of preparation is this: having bound a little wool round with a thread, and introduced the thread with a sharp rush into the pipe of the catheter, we adapt the wool to the opening at the head of the catheter, and having cut off the projecting parts of the wool with a pair of scissors, we put the catheter into oil. Having then placed the patient on a convenient seat, and used fomentations, if nothing prohibit, we take the catheter and introduce it at first direct down to the base of the penis, then we must draw the privy parts upwards to the umbilicus (for at this place there is a curvature of the passage), and thus push the instrument forwards. When in the perineum it approaches the anus, we must bend the member with the instrument in it down to its natural position, for from the perineum to the bladder the passage is upwards; and we must push the instrument forwards until it reaches the cavity of the bladder. We afterwards take out the thread fastened into the opening of the catheter, in order that the urine being attracted by the wool may follow, as happens in syphons."

On Intestinal Hernia[32]*:* "Enterocele is a

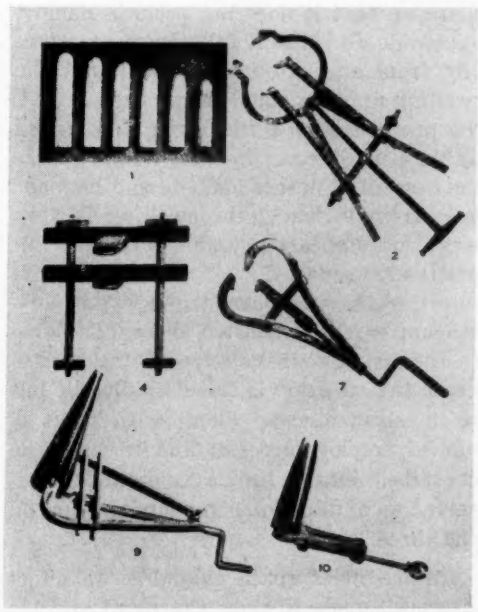

Fig. 9.—Early Greek surgical instruments.

descent of the intestine into the scrotum, and is occasioned either from rupture of the peritoneum which takes place in the groin, or from stretching of the peritoneum. Both these, I mean rupture and stretching, are occasioned by previous violence, such as a blow, a leap, or loud crying, but that from stretching in particular is connected with relaxation and other weaknesses of the body. The common symptoms of both are a marked swelling in the scrotum, which is increased by exercise, heat, retention of the breath, and other exertions; and its symptoms are, that it goes up slowly upon pressure, and quickly falls down again, and that while the person affected with it lies in a recumbent posture it remains in its proper place until he stands again erect. The retention of faeces in the region of the scrotum often brings on dangerous symptoms; for it is attended with pain, and sometimes with rumbling of wind upon pressure. The peculiar symptoms of hernia from distension are, that it does not occur suddenly, but gradually; that it falls down occasionally from any ordinary causes; that the swelling appears equable and deep-seated, the protruded intestine being surrounded by the peritoneum. In those from rupture the descent at first is sudden, and happens only from violence; the swelling is very large, and appears seated superficially immediately under the skin, owing to the intestines having burst through the peritoneum. If the omentum alone falls down to the scrotum in rupture of the peritoneum the affection is called epiplocele, but if intestine descend along with it, it is named epiploenterocele; and if water be contained in the tunica vaginalis, it received an application compounded from all the three."

In the brief space available, an effort has been made to show the spirit and the grandeur of the thought and practice of surgery in ancient Greece and Rome. To accomplish this purpose I have with deliberate intent made use of the *ipsissima verba* of various aspects of the writings of Hippocrates, Celsus, Soranus and Paulus. Much has had to be omitted concerning bandaging and instrumentation *(Figs. 8 and 9);* but the clear, simple thinking of patients as a whole, the justifiable empirical approach in the treatment of injuries and the cautious advice given in dealing with difficult situations appear to have a sound basis in present day practice of medicine. Also, the material cited focuses attention upon the important fact that the Greeks were guided by basic assumptions such as the orderliness of the Universe, the principle of causality and the necessity for relying upon human reason—significant assumptions accepted long before the advent of modern science which took place during the sixteenth and seventeenth centuries. Finally, these studies show that it is better to light a candle than to curse the darkness.

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